

The status of Australian mammals in 1922 – collections and field notes of museum collector Charles Hoy

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ABSTRACT

Charles Hoy, a collector for the US Museum of Natural History, spent three years in Australia (1919-1922) collecting at more than a dozen locations around Australia. He collected over one thousand specimens of mammals of more than 100 species. This paper collates the species collected by location and provides detailed quotes from his field notes and letters. Typically, his field notes and letters describe his collecting localities, detail what fauna he was able to collect, detail what additional fauna he had expected to collect, and speculate on the major land use changes impacting on the fauna. His letters and field notes provide valuable insights into the status of the Australian fauna and the perceived threats to its persistence at that time. He recorded a range of threats to mammals in temperate Australia, and singled out the desert fauna as being particularly vulnerable. In contrast, he recorded few threats in tropical Australia. Introduced foxes and cats, poisoning and trapping techniques to control rabbits, land clearing and hunting in localized areas, and regular burning of the forests were important factors in temperate Australia. He provides information of the timing of decline of mammals, distinguishing animals in the size category of the larger native rodents (the first to decline) and those the size of small wallabies (a subsequent decline). His fieldwork indicated an approximate synchrony in decline of medium-sized mammals at two distant locations (Eyre Peninsula in South Australia and Tamworth in New South Wales) in the period 1915-1918, which coincided with the eruptive wave of the fox invasion. In addition, he recorded the decline of specific species that he attributes to a combination of disease and predation from feral cats (the native cats *Dasyurus* spp.) or predominantly to disease (koala *Phascolarctos cinereus*).

Key words: decline, extinction, dasyuridae, peramelidae, potoroidae, macropodidae, phalangeridae, pseudocheiridae, petauridae, marsupial, rodent, bat, fox, cat, rabbit, fire, disease

Introduction

Charles Hoy traveled widely in Australia in the period 1919-1922 collecting mammals for the US Museum of Natural History. He recorded his views of the status of the fauna and speculated on the causes of its decline. Unfortunately, his views appear to have been overlooked in subsequent reviews of the fate of the Australian fauna (e.g. Troughton 1941; Ride 1970; Frith 1973; Burbidge and McKenzie 1989; Calaby and Grigg 1989; Morton 1990; Short and Smith 1994). This is unfortunate because Hoy had traveled more extensively than any other naturalist or collector of his day, spent extended periods in the field, and appeared to have consulted

widely with Museum staff, amateur naturalists, local settlers and Aborigines.

This paper provides extensive quotes from his letters and reports and details the mammals collected by him that are held in the US Museum of Natural History. Our aim is to publicize his collections and his views on the decline of mammals. We have made no attempt to address any issues of taxonomy other than to give a correspondence between the scientific names used by Hoy, the names under which his specimens are listed in the US Museum of Natural History, and the latest guide to Australian mammals (Strahan 1995).

* John Calaby died on 19 September 1998.

Methods

This study arose out of a visit by one of us (JC) to the US Museum of Natural History, where the correspondence and reports by Hoy were viewed and brief notes taken. Recently, we were able to obtain copies of the letters and reports. This paper consists largely of edited quotes from those documents. A recent journal search revealed a publication by Hoy (1923), that provided his overview of his Australian experience.

Charles Hoy traveled widely in Australia (Fig. 1), over the three year period June 1919 - April 1922, to collect mammals for the United States National Museum of Natural History (Smithsonian Institution). His travels included visits to New South Wales in 1919 (Wandandian, 14 miles north of Milton, 12 June - 8 August; 9 miles north of Gloucester at "Bulliac", 30 August - 2 October; 40 miles north-east, north and north-west of Tamworth, 16 October - 5 November), South Australia in 1919-20 (30 miles east of Farina, 17 December - 5 January; Kangaroo Island, 25 January - 20 February; 9 miles north and 3, 9 and 12 miles south of Port Lincoln, 13 - 28 March), Western Australia in 1920 (50 miles south of Busselton, 17 May - 21 June; Perth, July 17; 32 miles south-east of Derby, 9 August - 3 September), and Northern Territory in 1920 (Port Darwin, 1-3 October; 100 miles south of

Port Darwin, 12 October - 24 November). He returned to New South Wales in 1921 (Ebor, 52 miles east of Armidale, 13 January - 27 February), traveled to Tasmania (Arthur River "west of south from Smithton", 26 April - 21 May, Perkins Island of the north-west coast, 29 May - 1 June), thence to Queensland (Atherton Tablelands in the vicinity of Ravenshoe: 9 miles south, 23 July - 24 August, 5 miles south-west, 1 September - 18 October, 9 miles south-west, 18 - 25 October, 6 miles south, 4 - 8 November; Ravenshoe, 10 November - 10 December and finally to Chillagoe on 7 January 1922). He was in Sydney on 3 April 1922.

Hoy's collection at the completion of his travels contained 1179 mammals, including series of skeletal and embryological material, 928 birds, with 41 additional examples in alcohol, and smaller collections of reptiles, amphibians, insects and marine specimens.

He typically traveled by coastal shipping line to each major destination. He was disadvantaged in some locations by poor access to transport. For example, in Derby he had to hire a car to take him out and thus "trust to luck in getting to good country" when he would have preferred to have his own horse and rig, which would have allowed him to get to the "good country towards the head of the river".

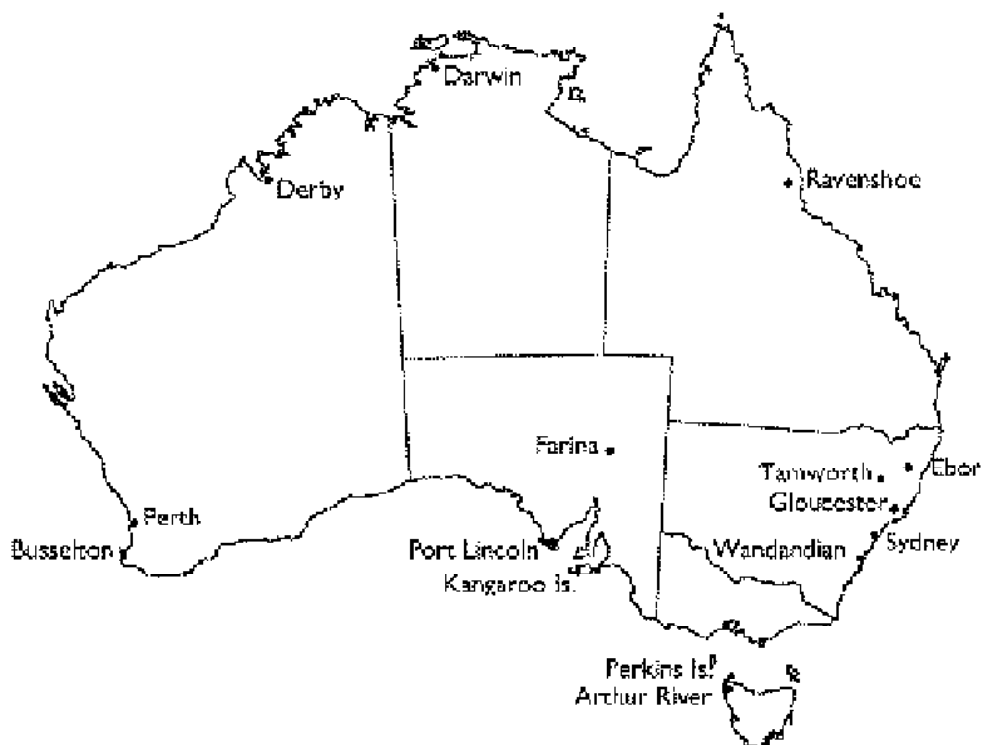


Figure. 1: Australia, showing locations where Charles Hoy collected mammals during his 1919-22 expedition for the US Museum of Natural History.

Hoy's first point of contact for local knowledge and advice in each State was the local museum. He accompanied local experts on collecting trips where possible. Hence he accompanied Harry Burrell to Tamworth, where the emphasis was on collecting platypus *Ornithorhynchus anatinus* and water rats *Hydromys chrysogaster*, including eggs and young. In South Australia, he was accompanied by E.L. Troughton from the Australian Museum in Sydney. Burrell and Troughton became acknowledged experts on the Australian fauna (Burrell 1927, Troughton 1938, 1941). Hoy made frequent references in his letters and reports to consulting with natives, presumably Aborigines, but probably local Europeans also.

He spent extended periods in the field: examples include nine weeks at Wandandian, a month at Gloucester, 22 days on the Eyre Peninsula, and 40 days at Busselton. He mentioned use of head torch, traps, snares, and shotgun for collecting specimens. In the latter part of his trip (from March 1920), he also had a rifle. His major reference book was Lucas and Le Souef (1909).

His letters include an interesting social commentary on Australia of the day (shipping strikes, anti-American attitudes, availability and price of goods, inflation, delays and difficulties of travel and the difficulty of dealing with bureaucracy). He also makes frequent mention of the abundance of birds, the other major group that he collected.

Hoy returned to the United States in April 1922 and thence was sent by the museum to China in December 1922. He died there in September 1923 from appendicitis compounded by residual effects of schistosomiasis contracted as a boy in China 15 years earlier.

Appendix 1 gives the correspondence between scientific names of mammals used by Hoy, names used in cataloguing his collection by the US Museum of Natural History, and the recent guide to Australian mammals (Strahan 1995). Copies of his correspondence and reports have been lodged in the CSIRO library (Short and Parsons 2001).

Results

Charles Hoy corresponded with Garrett S. Miller (Curator of Mammals) at regular intervals providing reports on his collecting trips and commenting on his experiences. These are detailed below. Specimens collected by Hoy and held in the US Museum of Natural History are collated by location in Table 1.

Wandandian, New South Wales (19 miles south-west of Nowra) 12 June - 9th August 1919

"Wandandian is situated in one of the largest remnants of the fast disappearing coastal scrub. The topography is also greatly diversified, there being three main types of country i.e. the low flat plains country bordering the sea, the hilly or mountainous country, and the flat tablelands. It is thus an ideal spot for collecting. The first mentioned is but thinly timbered and with dense undergrowth. It is here that the original coastal scrub is found forming an almost impenetrable jungle. The flat tableland, which is bordered on the seaward side by cliffs from one to two hundred and fifty feet in height is much like the coast plains but with the absence of the thick underbrush. It is also a very dry region and contains but a comparatively small amount of animal life.

Nine weeks were spent in the Wandandian region with the result of but one hundred and thirty one (131) mammals and one hundred and twenty four (124) birds collected. Among the mammals ten genera and twelve species are represented in my collection."

Hoy provided a table in his report that listed: mammals in his collection –

Phascogale flavipes; *Phascologomys mitchelli*, *Trichosurus vulpecula*, *Pseudochirus peregrinus*, *Petauroides volans*, *Petaurus australis*, *P. breviceps*, *Acrobates pygmaeus*, *Petrogale penicillata*, *Macropus ruficollis*, *M. ualabatus*, *Vesperugo pumilis*, and *Mus assimilis*;

mammals on the verge of extinction in the Wandandian district (according to the natives)

–

Echidna aculeata, *Dasyurus maculatus*, *Perameles obesula*, *P. nasuta*, *Petaurus australis*, *Petrogale penicillata*, *Macropus giganteus*, and *Canis dingo*;

mammals exterminated in the district -

Dasyurus viverrinus, *Phascolarctus cinereus*, *Potorous tridactylus*, *Bettongia penicillata*, *Aepyprymnus rufescens*, *Macropus thetidis*, and *Hydromys chrysogaster*;

"Besides the above mammals I have, in my collection the following introduced animals – fox, rabbit, brown rat and house mouse. Also a bunch of unidentified skulls picked up from the floor of a cave.

Table 1: Summary of specimens collected by Charles Hoy and held in the US Museum of Natural History.

Note that specimens in the museum register are often given sub-species designation. Abbreviations: Armid. = Armidale; Ather.T. = Atherton Tablelands; Arm. = Armidale; Bl = Bathurst Island; Chill. = Chillagoe; Crbk = Cranbrook; Darwin = Port Darwin; Dor. = Domingo; Glouc. = Gloucester; Kang. I. = Kangaroo Island; Marg. R. = Margaret River; Perk. I. = Perkins Island; Port L. = Port Lincoln; Smthn = Smithton; Syd. = Sydney; Oenp. = Oenpelli; Tam. = Tamworth; and Wand. = Wandandian.

Species	Wand., NSW	Milton, NSW	Glouc., NSW	Tam., NSW	Ebor, NSW	Farina, SA	Port L., SA	Kang. I., SA	Marg. R., WA	Derby WA	Darwin, NT	Ather.T., Qld	Perkins I., Tas.	Arthur R., Tas.
<i>Tachyglossus aculeatus</i>			2	3				5				2		1
<i>Ornithorhynchus anatinus</i>			8	9								12		
<i>Antechinus godmani</i>												13		
<i>A. minimus</i>													1	1
<i>A. stuartii</i>	17	1	3		31							2		
<i>A. swainsonii</i>		1		2	6									3
<i>Dasyurus geoffroii</i>									1		16	3		
<i>D. hallucatus</i>														
<i>D. maculatus</i>												9	2	9
<i>D. viverrinus</i>	2 Syd.													
<i>Sarcophilus harrisi</i>														8
<i>Myrmecobius fasciatus</i>									1 Crbk					
<i>Thylacinus cynocephalus</i>														2?
<i>Isodon macrourus</i>											8	4		
<i>I. obesulus</i>	1 Syd.	11							1					2
<i>Perameles nasuta</i>	3 Syd.	1	6									7		
<i>Trichosurus caninus</i>			8		1									
<i>T. vulpecula</i>	7	2	11	1	1		1	16	40		6+2 Bl	22	2	2
<i>Acrobates pygmaeus</i>					1 Arm.									
<i>Petaurus australis</i>	1													
<i>P. breviceps</i>	10	50			4									
<i>Pseudocheirus albertsii</i>												1		
<i>P. herbertensis</i>												2		
<i>Pseudocheirus lemuroides</i>												14		
<i>P. occidentalis</i>									14					
<i>P. peregrinus</i>	8		11		3							15	5	
<i>Schoinobates volans</i>	24	31	1		4							8		
<i>Aepyprymnus rufescens</i>												11		
<i>Bettongia penicillata</i>					2 Arm.				13			1		
<i>Dendrolagus lumholtzi</i>												3		
<i>Hypsiprymnodon moschatus</i>												5		
<i>Macropus agilis</i>										37	13			
<i>M. antilopinus</i>											8			
<i>M. eugenii</i>							1	13						
<i>M. fuliginosus</i>							3	7	1					
<i>M. giganteus</i>	2			4	2							2		
<i>M. parryi</i>													9	
<i>M. robustus</i>											7		7	
<i>M. rufogniseus</i>	1				4									
<i>M. rufus</i>							2							
<i>Onychogalea unguifera</i>										3				
<i>Petrogale concinna</i>											8			

Species	Wand., NSW	Milton, NSW	Glouc., NSW	Tam., NSW	Ebor, NSW	Farina, SA	Port L., SA	Kang I., SA	Marg R., WA	Derby, WA	Darwin, NT	Ather.T., Qld	Perkins I., Tas.	Arthur R., Tas.
<i>P. inornata</i>	3			3	2	1						2+1 Chil.		
<i>P. penicillata</i>					2									1
<i>Potorous tridactylus</i>									9					
<i>Setonix brachyurus</i>													4	1 Smtln
<i>Thylogale billardieri</i>												14		
<i>T. stigmatica</i>														
<i>T. thetis</i>	2		15		1 Dor:									
<i>Wallabia bicolor</i>	7	9			2							4		
<i>Phascogale cinereus</i>			3											
<i>Vombatus ursinus</i>	1													
<i>Pteropus alecto</i>											5			
<i>P. conspicillatus</i>												4		
<i>P. scapulatus</i>											1			
<i>Taphozous georgianus</i>											1 Oenp.			
<i>Hipposideros ater</i>														
<i>Chalinolobus gouldii</i>			1			13	1	1			1			
<i>C. morio</i>							1	1	1					
<i>C. nigrogriseus</i>										3		1		
<i>Miniopterus schreibersii</i>					4									
<i>Nyctophilus arnhemensis</i>												1		
<i>N. bifax</i>											2	1		
<i>N. geoffroyi</i>				1		1	1							
<i>Pipistrellus pumilus</i>	1				1							1		
<i>P. regulus</i>								1						
<i>P. sagittula</i>							1	2						2
<i>P. tasmaniensis</i>					2									
<i>P. vulturinus</i>						2								
<i>Scotorepens greyii</i>											1			
<i>Mormopterus planiceps</i>						3								
<i>Oryctolagus cuniculus</i>	1			5	1				2 Perth			1		
<i>Hydromys chrysogaster</i>														
<i>Melomys cervinipes</i>					2						7	8		
<i>Mus musculus</i>	2		1					1	1			3		
<i>Pseudomys sp.</i>												1		
<i>Pseudomys sp.</i>														9
<i>Rattus fuscipes</i>	10	7	1		16		3	22				11		
<i>R. lutreolus</i>					9									7
<i>R. norvegicus</i>									1 Perth					
<i>R. rattus</i>	4		5		1		3		1 Perth					1
<i>R. tunneyi</i>											8			
<i>Uromys macropus</i>												2		
<i>Canis familiaris</i>					1				1					1
<i>Vulpes vulpes</i>	1				1	1								
<i>Felis catus</i>							1							

The most numerous of the above mammals are – *Mus assimilis*, *Macropus ualabatus* and *Petauroides volans*. *Mus assimilis* is found everywhere in such numbers as to be a nuisance, *Macropus ualabatus* is most numerous in the mountains but is also found on the tablelands and coast plain. *Petauroides volans* is found everywhere that there are tall trees. *Phascologale flavipes* is found in the mountains and coast plains but always near water. *Phascolomys mitchelli* is found among the rocks both above and below the cliffs which border the tableland. *Trichosurus vulpecula* and *Pseudochirus peregrinus* have a pretty general distribution but are most plentiful along the creeks. *Petaurus australis* is rare, only one specimen being obtained, this was shot on a hilltop; *P. breviceps* is plentiful along the creeks though sometimes obtained some little distance from water. *Petrogale penicillata* is scarce and hard to obtain, as they inhabit the cliffs bordering the tablelands where they run about with wonderful agility in places where it would scarce seem possible for a fly to walk in safety. *Macropus ruficollis* is found on the coast plains and tablelands, as is also *M. giganteus* the latter being very scarce and hard to obtain. *Canis dingo* is now practically exterminated but a few are seen now and then. Those that are seen are mostly cross-breed. *Perameles obesula* and *P. nasuta*, also, *Dasyurus maculatus* and the echidna are now practically exterminated the first two still are occasionally found in the brush of the coast plains, while the latter two are found in the mountains. Among the bats, apparently the only one to stay all winter is *Vesperugo pumilus*. Of these, only a few were seen and but one obtained. The others, according to the natives, migrate north in the winter.

The greatest agent working towards the extermination of the native animals is the fox, next comes the cattle and sheep men who distribute poison by the cartload in the effort to reduce the rabbits. This has also caused or helped to cause the extermination of some of the ground inhabiting birds. Another great agent is the bush fires which sweep over the country. These are often lit intentionally in order to clean out the undergrowth and thus increase the grass.

Owing to the great increase in the price of rabbit skins and the consequent increase in trapping, the rabbits are fast ceasing to be a pest, and in some sections have become quite scarce. The foxes, which are everywhere numerous, after

killing off the native mammals are now turning to the rabbits which also helps in their reduction! The extermination of the native mammals have apparently gone much further than is generally thought. Many species that were plentiful only a few years ago are now almost, if not altogether, extinct. Disease has also played a great part in the extermination. The native bear died in thousands from a disease which produced a great bony growth on their heads. A mysterious disease also spread through the ranks of the native cat *Dasyurus viverrinus*, the domestic cat also played a great part in their extermination. Even adult specimens of *Dasyurus* were often dragged in by the family cat.

The only mammals caught in traps were *Mus assimilis* and *Phascologale flavipes*. The others were all shot or snared. As the majority of the mammals were nocturnal and arboreal, the headlight proved to be a valuable and indispensable part of my outfit. The hunting of kangaroos and wallabies was greatly handicapped through the lack of a rifle."

Sydney, New South Wales mid August 1919

"*Perameles nasuta* has been practically exterminated throughout New South Wales but they are still to be found in Mosman, one of Sydney's suburbs, so I made a trip out there and was able to get a fine female with two young in her pouch. This was trapped inside the Taronga Park Zoo grounds with the kind permission of Mr A.S. Le Souef. The fact of *Perameles nasuta* being found at Mosman is probably due to the isolation of that district from the rest of New South Wales by the city of Sydney, thus keeping out the foxes."

Gloucester, New South Wales 30th August – 2nd October 1919

"The work in the Gloucester district was done at Bulliac, nine miles northeast of Gloucester. One month was spent there and eighty five mammals and sixty six birds were collected. Among the mammals seven new genera, including eight species were added to my collection.the new mammals, in the order of their numbers, are as follows *Macropus thetidis*, *M. parma*, *Trichosurus caninus*, *Ornithorhynchus anatinus*, *Echidna aculeata*, *Phascolarctus cinereus* and two bats which I was unable to properly identify but which are quite likely *Chalinolobus nigrogriseus* and *Nyctonomus norfolcensis*. Only one specimen of *Echidna* was

procured and *Phascolarctus* is represented only by weathered skulls. The latter, according to the natives, is now extinct but I considered it still exists as the animal to which one of the skulls belonged could not have been dead more than three or four months at the most.

The country at Bulliac is a good example of what the cattle men will do in a few years time in killing off and burning the timber on the consequent destruction of animal life. Five years ago Bulliac was a virgin forest but then the railroad was built and now it is devoid of living trees for miles on each side of the track except for small and scattered patches in the more inaccessible gullies which form the last resort of the fast disappearing mammals. It is a very mountainous region and although it is a good distance from any large city (Newcastle 60 miles south being the nearest) it can be easily reached by railroad and consequently great numbers of men come up for the shooting. There are few game laws in Australia and no one gives any attention to the ones that are in order. The Bulliac trip has clearly shown that the edge of the settlements, and even a short way into the wilds, is no better than the older settled parts and in order to get results one must go into the wilds. It is the killing and burning of the brush, by the cattle men, that does the most to kill off the animals, and they are yearly reaching further and further from the railroads.

One thing was very noticeable was the great abundance of the introduced rats. They seem to have driven out or killed off practically all the native rats and I found them everywhere. They have even, apparently, driven out *Hydromys* for I found them living in large burrows along the river and the natives say *Hydromys* used to be found there while none have been seen lately. They have even taken to the trees and I found them in several hollow trees that I felled.

Besides the mammals new to my collection I secured: *Macropus ualabatus*, *Pseudochirus peregrinus*, *Trichosurus vulpecula*, *Petauroides volans*, *Mus assimilis*, *Phascologale flavipes* and *Perameles nasuta*. *Petauroides volans* and *Mus assimilis* both so common on the South coast are represented by but one specimen each, while *Phascologale flavipes* by but two. *Macropus ualabatus*, *M. parma* and *M. thetidis* are rather common as are also *Pseudochirus peregrinus* and both *Trichosurus vulpecula* and *T. caninus*. *Perameles nasuta* is becoming rather scarce and but one *Echidna* was obtained. The *Platypus* is

still rather common but owing to its habits rather hard to get."

Tamworth District, New South Wales 16th October – 5th November 1919

"Work in the Tamworth District was done in three separate regions i.e. (1) The top of the New England mountains, on the Namoi river 40 miles north-east of Tamworth. (2) lower down on the Namoi 40 miles north of Tamworth and (3) 40 miles north-west of Tamworth on the Manilla River. The work in the latter region was merely incidental as that was the starting point and finish of the trip. All regions were of very mountainous nature and, with the exception of the Manilla River, sparsely settled.

The trip was made primarily for the eggs and young of the *Platypus*. Fifty miles of bank was searched and approximately one hundred burrows were dug out only six of which contained young. These six burrows furnished eleven young The intense drought which has scarcely been broken for over twelve months (it is the worst since 1862) has advanced the breeding of the animals somewhat so we were too late for eggs. The *Platypus* although scarce is not by any means nearing extinction and if they will be continued to be protected there is every hope that they will never become extinct. Young *Hydromys* were also looked for but the drought seems to have interfered with their breeding and but two embryos were obtained. The adults themselves were very scarce and but six specimens were obtained.

Most of my time was employed in the search for *Platypus* and *Hydromys* but 30 mammals and 39 birds, in all, were obtained. Among the mammals, three new species were obtained i.e. *Macropus giganteus*, *Hydromys*, and an unidentified bat which was incidentally the only bat seen on the trip.

Mammals of all kinds were very scarce, more so than in the other parts of New South Wales visited by me. Even as late as three years ago the Tamworth district was literally overrun by *Onychogale frenata*, *Petrogale penicillata*, *Macropus ualabatus* and *ruficollis*, and *Aepyprymnus rufescens* but soon after the advent of the foxes they disappeared so that now *Onychogale frenata* and *Aepyprymnus rufescens* are extinct and the others rapidly approaching extinction. *Dasyurus* was wiped out about eight years ago by the domestic "tabby" cat in the wild. According to the natives the native rodents never occurred there while the small rat-like

marsupials and jerboa rats disappeared long ago. A few flying phalangers still exist but are very rare. From descriptions, it is either *Petaurus breviceps* or *sciureus*. According to Lucas and Le Souef's book the Tamworth phalanger resembles *sciureus* in colour and size but *breviceps* in having the fourth finger longest. The above book however I find to be frightfully inaccurate and so cannot rely on its descriptions of species, even though it is recognized as the best work on Australian mammals. It is no wonder that there is no better work for according to the Australian Museum authorities, and others who should know, there is no one in all Australia who is an authority on Australian mammals or even the mammals of one state!

It is only of very late years that people are becoming at all interested in mammals. Heretofore it has always been birds probably because of their beauty and the ease with which they can be procured. Among the few who are beginning to take an interest is Mr Chas Baldwin of Durham Court, Manilla, New South Wales. He is a famous horse and cattle breeder and has lately taken to breeding up native mammals which are approaching extinction. He has had great success and his experiment with the Bridled Wallaby is of singular interest. In eighteen months time he has bred 70 young from five adults! Which shows that the wallaby is anything but a slow breeder.

All thanks for the success of the trip are due to Mr Harry Burrell, of Sydney, who is recognized by the Australian Museum as being the world's foremost authority on the habits and breeding of the monotremata. I can safely say that without his aid I would not have been able to get young of the platypus."

**Farina, South Australia (Mt Lyndhurst)
17th December 1919 – 5th January 1920**

"Work, in the Farina district, was done at Mt Lyndhurst 30 miles east of the town of Farina. Nineteen days were spent there, resulting in the collection of 110 birds and 64 mammals. A few reptiles and insects were also collected.

The mammals of the district are very scarce and consist principally of bats. Foxes are very plentiful and, as in every other district I have so far touched, seem to have cleaned out the smaller native mammals. The natives of the district say that some years ago jumping rats and mice were common but I was unable to find the slightest traces of any small mammals. The only marsupial I was able to get was

Macropus rufus, of this species I was able to get one good specimen of both male and female. I also picked up a skull of *M. rufus* in excellent condition also a more or less weathered skull which is evidently some kind of rock-wallaby. All the other mammals, with the exception of one fox skull, are bats. I was able to secure four kinds of the latter. Owing to the poor description in Lucas and Le Souef's book I am unable to identify them accurately but in all probability they are – *Nictomonous plicatus*, *Chalinolobus nigro-griseus*, *Nyctophilus timoriensis*, the fourth bat is a rather small one of greyish colour which I have been unable to identify."

"The country around Farina and Mt Lyndhurst is typical sub-desert country and is composed of both flat salt-bush plains and hilly country which has a thin covering of mallee scrub. There is no water except where wells have been dug and windmill pumps erected. Through the saltbush plains wind numerous "gum creeks" – dry water courses lined with gum trees which are kept alive by the underground streams.

Contrary, as to what is found on the same type country in the U.S., there is very little reptilian life and what reptiles do occur are mostly nocturnal."

**Letter to Dr Miller from Adelaide,
South Australia
January 11th 1920.**

"I went to the place (Mt Lyndhurst) that was reported to be least affected by drought but nevertheless was greatly disappointed in the scarcity of mammals. I will have to make another try after the desert fauna – quite likely through Queensland next spring.

Mr E.L. Troughton, who is in charge of the mammals in the Australian Museum, Sydney is travelling with me while I am in South Australia."

**Letter to Dr Abbott from Adelaide,
South Australia
January 11th 1920.**

"I have just returned from a trip into the interior (Mt Lyndhurst). I picked this place because it was reported to be the least affected by the great drought. The trip however was very disappointing as far as mammals were concerned. With the exception of a pair of *Macropus rufus* and a few old skulls my mammal specimens numbering 64 were all bats. Of these I was able to secure four kinds. I spent 19 days

collecting in the region.”

Kangaroo Island, South Australia
25th January – 20th February 1920

“Twenty six days were spent, in the field, on Kangaroo Island, S.A., with the result of 85 mammals, 51 birds, and miscellaneous reptiles, amphibians, and marine specimens collected. The mammals represent the following species – *Macropus giganteus* var. *fuliginosus*, *Macropus eugenii*, *Trichosurus vulpecula*, *Echidna aculeata*, *Mus assimilis*, and two bats – most likely *Chalinolobus nigro-griseus* and *Chalinolobus morio*. Of these two, *C. morio* was, by far, the most plentiful.”

“The mammals differ a good deal, both in appearance and habits, from those of the mainland so I will treat each separately.

Macropus giganteus var. *fuliginosus* – This kangaroo, although listed in the British Museum catalogue as only a variety of *M. giganteus*, differs a great deal in both appearance and habits. The following are the main differences – colour – the K.I. kangaroo is smoky brown with black paws and feet, is more slender around the chest and neck and has (apparently) a shorter tail. In habits it is totally different as it frequents the thickest scrub and travels with head low down like a wallaby. It is also much less pugnacious than the mainland form.

Macropus eugenii – This wallaby was not met with on the mainland but in habits it resembles the other wallabies on the mainland.

Trichosurus vulpecula – The K.I. phalanger differs mainly in having the scent glands, situated at base of tail, much less developed than in the mainland form. It gives out practically no smell while the mainland one is very rank. The fur is longer and the tail a trifle shorter – the former is quite natural owing to its more southerly habitat. In habit it is entirely different. Instead of living in hollow trees it lives under the low yacas (grass trees) and also burrows in the banks of the dry creeks and although ascending trees, at times, it feeds mostly on the ground. It also, apparently, doesn’t call out, for although in the field almost a month, I never heard a sound from them, except when in the death struggle. The mainland form is a very noisy fellow who gives vent to his “roarings” all night long.

The *Echidna* is very plentiful on the island. As I did not meet with them very often on the

mainland I cannot compare their habits. Their “diggings” can be seen everywhere on the island and some places the ground has been gone over so much that it almost has the appearance of a tilled field. It feeds both in daytime and night though mostly the latter. Of the five specimens obtained two were caught while feeding at night, one while feeding in the middle of the day, and one was found, in the early afternoon, “dug in” with only the tips of his quills showing. They differ in appearance by having longer and more hair and by having a pronounced part about an inch wide running down the middle of the back. This part is filled with a thick growth of wiry hair. They are very fat – a big one yielding as much as two quarts of oil which is much used by the Islanders in frying food. The flesh is also eaten and is said to resemble pork.

Mus assimilis is rather common and, in appearance and habits closely resembles the mainland form although it seems to be somewhat smaller.

Of the two species of bats collected both kept close to the big timber along the creeks – very few being seen over the scrub.

The vegetation of the island is of two main kinds – the low, dense and prickly scrub and the more open mallee country. Besides this there is a more or less thin scattering of big timber along the creeks. The scrub is of very volatile nature and fires are very common. Even the green bushes burn like oil soaked beacons. These fires are set intentionally with the purpose of burning off the scrub but they are never followed up and so in two or three years time the scrub is as thick as ever. The worst of the fires is that once started nothing is done to check them and they consequently sweep across the island. From what I personally saw and from what the natives tell me, these fires will ultimately lead to the extermination of the smaller marsupials.

Foxes and rabbits were never taken to the island but the domestic cat was let loose and is now very plentiful – to the expense of the small mammals and birds.

Besides the mammals I secured, I am told that several small marsupials are found on the island but are now very scarce. Personally, I didn’t see any signs of them. One was a bandicoot but the descriptions of the others were so vague that I was not able to tell what they were.”

**Letter to Dr Miller from Adelaide,
South Australia
April 14th 1920**

"I am enclosing my report on the Eyre Peninsula. This will end my work in South Australia and I move on to the West as soon as possible. Australia certainly is a discouraging place for collecting. So many of the mammals are extinct and all the others nearly so. The sad fact of it is that, according to all reports, the mammals have only become scarce during the last few years."

**Port Lincoln, South Australia
(Eyre's Peninsula)
13th March – 28th April 1920**

"The trip to Eyre's Peninsula was another comparative failure, as far as mammals were concerned, though fair results were obtained among the birds. Twenty two days were spent in the field resulting in the collection of eighty six birds and but fifteen mammals. A few miscellaneous specimens including reptiles, crustacea, etc, were also obtained.

Two different types of country were worked. The first camp was pitched on the Todd River, nineteen miles north of Port Lincoln. Here the scrub was of two kinds, mallee and broom-bush with occasional patches of big gum trees. The second camp was made on Proper Bay, nine miles south of Port Lincoln. Here the scrub was also of two kinds - dwarf mallee and ti-tree. The land here was of limestone formation with but little soil, while the first camp was pitched in granite country with a fair amount of soil in the valleys.

The poor luck in mammals is explained by the total extermination of most of them. This has been caused mainly through the introduction of foxes and cats. Both these animals are extremely plentiful. The fox has only been plentiful during the last three and four years and are still being introduced by the sheep men as they claim that the fox kills rabbits. This may be so but what killing he has done has made very little impression on the rabbits while native mammals have been completely wiped out. This has been done only during the last few years, which is illustrated by what an old kangaroo hunter told me. He said that as late as two years ago he was sure of at least six or seven dozen wallaby skins a week while this year he hasn't even seen one! This was substantiated by numerous other individuals. One gentleman took me to a place where only

eighteen months ago he shot nineteen wallabies in one evening. He also said that bandicoots and 'pinkies' (quite probably the rabbit bandicoot) were quite common then. We searched carefully but not even any signs were seen while traps brought no result. The banded anteater (*Myrmecobius*) was also occasionally seen up to several years ago but the last one seen was taken by a boy in a rabbit trap eighteen months ago. The bandicoots and "pinkies" are said to still exist but I was not able to hear of any being seen in the last six months.

That the cats are wreaking havoc among the birds is shown by the fact that one cat I killed had five birds and the unidentifiable remains of a small marsupial in its stomach!

Five species of native mammal were obtained, and of these three are bats - most likely *Chalinolobus nigrogriseus*, *C. morio*, and *Nyctophilus timoriensis*. The other two species were *Macropus giganteus* and *Mus assimilis*, both of which are rather scarce."

**Letter to Dr Miller from Perth,
Western Australia
May 8th 1920**

"... I have set a few traps around here and succeeded in catching two fine adult, female specimens of *Hydromys fuliginosus*, also two specimens, male and female, of *Mus decumanus*, caught in runways on the swampy banks of the river Swan. I think that I said something in my Gloucester report about *Mus decumanus* being found there. That was a mistake. It was merely the light form of *M. rattus*. It seems that the former is scarce, in the East, being confined chiefly to the cities while the latter is found almost everywhere throughout the bush. Here in the West I am told just the opposite - *M. rattus* is scarce and *M. decumanus* is still found in the bush. I am told that a few native cats are still to be found around here but I have not yet gotten on to any.

..... After consulting maps and papers from the Museum, I have not been able to get much first hand information. I have finally decided to go down on the Margaret River in the extreme south west of this State, for my next trip. About my only guide is a paper by G.C. Shortridge entitled "Account of the geographical distribution of the Marsupials and Monotremes of south-west Australia, having special reference to specimens collected during the Balston

Expedition of 1904-1907". At that time, the south-west seemed to hold the greatest variety of mammals but of course that was a long time ago and there is no telling what the conditions are now. According to the government maps however, the only bit of virgin forest that still exists in Western Australia is to be found in the South-west, so I have hopes."

Letter to Dr Miller from Perth, Western Australia
July 2nd 1920

"I certainly hope that Dr Abbott approves my trip to Central Australia. Although white man has not yet reached that country the fauna is by no means safe as the cat has already reached the most remote parts of the Australian continent and as the fox and rabbit are spreading fast, it is only a matter of time before they too overrun the place. When this happens its goodbye to the native fauna for in the desert country, it seems that the native fauna cannot make, even the feeble stand that it can in the more favorable types of country. Obviously, if there is any thing of interest in that country it will have to be obtained now or not at all. From what I have seen and heard I think that it is safe to say that in no part of Australia is the fauna safe from extinction. It is true that the animals are scarcer in the immediate vicinity of settlements than elsewhere but the various introduced pests are not sticking to the settled parts and consequently there is practically no part of Australia where the fauna hasn't decreased in the last few years."

Letter to Dr Miller from Perth, Western Australia
July 15th 1920

"Was out twice, in the Darling Ranges near here, and both times got wet to the skin. Was able to get a few birds but no mammals. I am told that there is a place about fifty miles from here where there are still a few rabbit bandicoots left, so I will try to slip out for a few days and give them a go."

Busselton, Western Australia (50 miles south)

14th May – 20th June 1920

"Camp was pitched fifty miles south of the town of Busselton, on the edge of the Government Timber Reserve. Forty days were spent in camp (May 14-June 23). The formation is limestone

with occasional outcroppings of granite and is, almost everywhere, hollow. Even an ordinary foot fall creating a hollow boom. There are also several large caverns that are regular points of interest for tourists. The bush is of two main kinds – the coastal scrub, composed mostly of grass-trees and thick scrub, and the big timber country which seldom approaches closer than three miles to the sea. The timber is composed of mixed karri and jarrah interspersed with numerous open, grass flats. This forest covers practically the whole country between Busselton and Albany, with the exception of the narrow strip of coastal scrub, and is the only bit of virgin forest left in the southern part of Western Australia. Between the coastal scrub and the big timber runs a very narrow strip of mallee bush.

..... The collection contains ninety-four mammals, forty six birds and a few miscellaneous alcohol specimens (reptile and land shell).

The mammals obtained were as follows: *Macropus giganteus* and *M. brachyurus*, *Trichosurus vulpecula*, *Pseudochirus occidentalis*, *Bettongia penicillata*, *Perameles obesula*, *Dasyurus geoffroyi*, *Hydromys fuliginosis* (?), and *Chalinolobus* -?-. Beside these one skull of *Canis dingo* and *Bettongia lesueuri greyi* (?) were picked up. None of the mammals, with the exception of *Trichosurus vulpecula*, were plentiful. A very good colour series of the latter were obtained, the colours running from light blue black with white belly, feet, and tail, through brown to almost black specimens. *Macropus giganteus* is very scarce and wild. One specimen only was obtained and as it got away in the thick brush and wasn't found for several days, only a skeleton could be saved. They are found in both the coastal scrub and the big timber country. *M. brachyurus*, while not rare, is a strictly nocturnal animal and so is seldom seen. It is found mostly in the swamps. *Trichosurus vulpecula* is found everywhere and lives both in hollow trees and caves. *Pseudochirus occidentalis* was said to be nearly extinct but I found them fairly plentiful, scattered out through the big timber. *Perameles obesula* was said to be extinct; one specimen was secured from a settler who caught it on a runway through a swamp. *Dasyurus geoffroyi* is now quite scarce. The one specimen obtained was caught in a 'possum snare'. One *Hydromys* was obtained along a small brook and is (from its size) evidently a half grown one. Bats were very scarce and but two

obtained. Both are of the same species and of the Genus *Chalinolobus*. Besides the above mammals, only one other kind was seen, namely, *Canis dingo*, one of which was seen but not obtained. *Mus musculus* was found everywhere through the bush but nothing was seen of any of the smaller native mammals. That they do occur, however, is shown by the fact that cats, very occasionally bring them in. There are evidently several kinds but I was only able to identify one, the 'possum mouse' (most likely *Dromicia concinna*) from the description. That the mammals are slowly disappearing from the South-west is a recognised fact. This can only be due to the fierce bush fires that rage almost every summer, through the country for it is all, practically, virgin country and the fox and rabbit have not yet reached it. These fires burn out all the under-growth but the jarrah and the larger karri are immune to them. There is only one imported pest that would prey on the native mammals and that is the domestic cat. These animals go wild and are not uncommon and reach to immense sizes. I personally saw the skins of two that were said to have weighed thirteen and a half and fourteen pounds respectively. I do not think that this was at all an exaggeration for they were tacked out every bit as big as a big fox skin. When the ordinary sized house cat will bring in mammals the size of the native cat and ring tail 'possum it can be clearly seen what damage their larger brethren of the bush do to the native fauna."

**Letter to Dr Miller from Derby,
Western Australia
September 6th 1920**

"I was disappointed in both the country and the results obtained."

**Derby, Western Australia
(32 miles south-east)
9th August – 3rd September 1920**

"Twenty-three days were spent in the above locality, (August 7-29). The locality visited was very poor in both mammal and bird life and a collection of only 43 mammals, 68 birds and 10 reptiles. I was somewhat handicapped by not being able to get a horse and rig and so was not able to cover as much ground as I had intended. Camp was pitched on the bank of the Fitzroy River 32 miles south-east of Derby. The country here is low and flat and from all indications is very boggy in the wet season. It is covered, for the

most part, with a rather scattered growth of low trees although there are numerous open grass plains, up to several square miles, where not a tree is to be seen. About ten miles south of the river is a low range of hills covered with spinifex and a few scattered bushes. The whole of the country is well watered, there being numerous claypans scattered through it, as well as the Fitzroy River, which is running all year around.

Three kinds of mammals, only, were met with, i.e. a species of *Macropus* (not mentioned in Le Souef's book), *Onychogale unguifera* and an unidentified bat. Of these the *Macropus* was, by far, the most numerous, being found everywhere, except on the grass plains. *Onychogale unguifera* was very scarce (although I am told that they are very plentiful further up the river) and were found only on the open grass plains. The bats were obtained while flying among the trees and, while not scarce, were difficult to obtain as they do not appear until it is quite dark. One thing, of value, at least, was obtained, same being an embryo kangaroo, in the uterus. This, latter, was preserved entire, being merely slit to make sure of the presence of an embryo. I have opened every female marsupial that I could lay hands on, but this is the first embryo that I have come across."

**Port Darwin, Northern Territory
(Brocks Creek and Douglas River;
100 miles south)**

1st October – 24th November 1920

"Forty four days were spent in the field in the Northern Territory of Australia (Oct. 12 to Nov. 24). An area of country thirty miles in extent, running south by west from Brocks Creek to the Douglas River, was worked. On this trip 114 mammals, representing about 15 species, 106 birds, and 17 miscellaneous reptiles and amphibians, etc., were obtained.

In the immediate vicinity of Brocks Creek the country is very hilly, the hills being formed of ridges and outcroppings of granite and quartz. Among these hills are numerous "flats" of varying size which are covered with a sparse growth of timber and with occasional open grass plains. The country changes until the Douglas is reached, where the hills have disappeared and the river is bordered with great plains which are also covered with a mixture of light timber and open grass plains. Here the rock formation is limestone with very occasional outcroppings of granite. On the immediate river bank is a very dense growth of timber and bamboo, but the dry

creek beds are also lined with a dense growth of bamboo, but away from these creek and river banks the growth is very sparse, with exception of the grass which grows up very rank in the wet season. This grass, in places, grows to a height of fifteen or more feet but dies down shortly after the wet season is over.

The mammals collected are as follows:

Macropus antilopinus; *M. robustus*; *M. agilis*; *Mus* sp.; *Petrogale* sp.; *Dasyurus hallucatus*; *Perameles macrura*; *Pseudochirus* sp. (or *Trichosurus* sp.); *Hydromys fuliginosus*; *Pteropus gouldi*; and four or five species of bats.

Taking the above in their order: *M. antilopinus* is rather plentiful and is found generally on the plains away from the hills, although they will take to the hills when pursued. They keep together in rather large mobs. *M. robustus* is found only among the rocks on the hills, does not travel in large bands and is very shy. *M. agilis* was secured only along the Douglas River and was rather plentiful. This is the same wallaby that I secured along the Fitzroy River in the west and, at the time, was not able to identify. I saw a few specimens of this wallaby just out from Port Darwin but was not able to secure any. The *Mus* I am not able to identify as to its species. It was found everywhere, digging its burrows both in the banks of the creeks and waterholes and on the plains far away from any watercourse.

The *Petrogale* I was also not able to identify. It was fairly common but owing to its habit of remaining under the rocks all day it was difficult to secure. A few specimens were shot and a few were caught in rat traps baited with raisins. *Dasyurus hallucatus* was found everywhere and was caught both in meat and raisin baited traps. One female that was cut out of a tree had a litter of eight young. *Perameles macrura* was also found everywhere and all the specimens secured were shot at night with the aid of the headlight. They were very tame, coming right into camp at night to eat the scraps. The "possum" was obtained on the outskirts of Port Darwin where it is very plentiful. It lives in the rocks, ascending the trees only at night, to feed. I was not able to identify it as it has characteristics of both *Pseudochirus* and *Trichosurus*.

Only one specimen of *Hydromys fuliginosus* was obtained and that one was trapped on the bank of a small waterhole. There were no signs of them along the river, which may be explained by the

abundance of crocodiles found there. The only places that signs of them were to be seen, were along the water holes where no crocodiles were to be found. *Pteropus gouldi* was very plentiful and was to be found, in the daytime, camping in lots, up to about fifty in numbers, in the dense growth along the river. All the bats, save one, were obtained by shooting as they were flying about at dusk. That one species was obtained from a limestone cave, where I took a male, female and half grown young.

No introduced rats were met with in the country described above and the fox has not reached the Territory. The domestic cat however is very plentiful and was the only introduced pest met with. The rabbit has not yet spread that far. Beside the cat the small mammals and birds have a great enemy in the great fires that rage over the country every year. The fires are started intentionally to burn off the dead grass, which the cattle won't eat, and which forms a dense, tangled mass preventing the cattle from getting at the tender, new shoots."

Ebor, New South Wales

(52 miles east of Armidale)

13th January – 27th February 1921

"Two camps were pitched, one near the highest point on the northern New South Wales tableland, at an elevation of 5000 feet and one a thousand feet lower. It was at the first camp that the most successful work was done. Forty-four days were spent in camp (January 18 – February 27) and some interesting results were obtained. One hundred and forty one mammals, thirty four birds and nineteen miscellaneous reptiles, land shells, etc., were collected. The weather was very much against me, as heavy, drizzling fogs or rain was almost an every day occurrence and there were seldom two fine days at a stretch.

The mammals collected represent twenty different species, ten of which are new to my collection. They list as follows: *Macropus giganteus*, *M. ualabatus*, *M. ruficollis*, *Petrogale penicillata*, *P. ?* (represented by a single half grown specimen), *Trichosurus vulpecula*, *T. caninus*, *Petauroides volans*, *Petaurus breviceps*, *Pseudochirus peregrinus*, *Potorous tridactylus*, *Phascologale minutissima*, *P. swainsoni*, *Mus fuscipes*, *M. assimilis*, *M. ?* (a rat that does not seem to belong to the Genus *Mus* but which I have not been able to identify) and three species of bats. Of these the two *Phascologales* are the

most interesting as neither of them have ever been reported from that district. *P. swainsoni* has hitherto been known only from Tasmania and south-east Victoria and *P. minutissima* only from Queensland.

Of the above mammals: *Macropus giganteus* is found in the open forest on top of the plateau but is getting rather scarce, both *M. ualabatus* and *M. ruficollis* are to be found along the edge of the dense scrub and are also very scarce. Both the *Petrogales* live among the rocks on the sides of the gorges and although both are becoming rare *P. penicillata* is the most plentiful. *Trichosurus vulpecula* is to be found in the open forest but is practically extinct, *T. caninus* is also pretty scarce and is to be found only in the dense scrub. *Petauroides volans* is very plentiful, although I am told that they are not nearly so numerous as they were several years ago, they are found in the dense scrub and the open forest country. *Petaurus breviceps* is rapidly approaching extinction and only two specimens were obtained, both being taken from the open forest. *Pseudochirus* is rather rare and is to be found in the dense growth along the creeks and swamps. Some of them build nests of bracken and leaves, in the forks of the low trees and some live in hollow spouts.

Potorous tridactylus is now very rare, one specimen only was obtained from the edge of dense scrub at an elevation of 1000 feet. *Phascologale minutissima* is very plentiful and is found almost everywhere although they are the most plentiful in the dense scrub. *P. swainsoni* is rather rare and is found for the most part in the swamps where they make runways through the grass. A few were however, obtained in the scrub where the ground was comparatively dry. *Mus fuscipes* is plentiful and was found only in the swamps where they make very pronounced runways through the grass. *M. assimilis* is fairly common and was found mostly in the rocky parts although a few were taken in scrub. The unidentified rat is very rare and was found only in dense scrub.

Of the three bats, two kinds were obtained through shooting as they flew among the trees at dusk and one kind was obtained from an abandoned mine tunnel.

On the top of the Tableland the country is very hilly and is covered mostly with open forest growth although the valley bottoms are invariably swamps. In the open forest there is absolutely no undergrowth. At the edge of the Tableland the country falls away very rapidly and is cut deeply by

great gorges. Very little dense scrub is found on the top but from the beginning of the fall the mountain sides are clothed practically altogether with it. At places, however, there is a mixture of the open forest trees and the scrub trees and undergrowth. The rock formation is mainly basalt and granite.

Besides the native mammals a few specimens of the introduced rat and mouse, also the rabbit and fox, were taken. At the higher elevations the introduced rat was not met with but at the lower elevations both the rat and the mouse were found in the bush. Rabbits and foxes were found everywhere and were pretty plentiful. The natives of that district tell me that the following animals have disappeared within the last few years: Tiger cat, bandicoot, Rufous rat-kangaroo, Brush-tailed *Phascologale*, and several others I was not able to identify by their description. These mammals, they tell me, were plentiful up to a few years ago, when they suddenly disappeared. Mammals that I did not get but which are still to be found in the district are: *Macropus robustus* and *M. dorsalis*, *Canis dingo*, an *Onychogale*, and *Acrobates pygmaeus*. Although I spent a good deal of time looking for these last mentioned mammals I was not successful in securing any of them."

Arthur River (west of south from Smithton) and Perkins Island, Tasmania 26th April – 3rd June 1921

"Thirty three days were spent in the field in Tasmania, and two camps were made (April 26 - May 22 and May 28 – June 3). The first camp was pitched near the Arthur River south of west from the town of Smithton and the second was pitched on Perkins Island which is four miles north-west from Smithton and about one mile from the mainland. Seventy two mammals and 23 birds, beside a few miscellaneous reptiles, fish, etc. were collected.

The mammals collected were as follows:

Pseudomys (higginsii?), *Mus fuscipes (?)*, *Sarcophilus harrisi*, *Dasyurus maculatus*, *Pseudochirus cooki*, *Trichosurus vulpecula* var. *fuliginosus*, *Potorous tridactylus*, *Macropus billardieri*, *Phascologale swainsoni*, *Phascologale minima (?)*, *Perameles obesula*, and two kinds of bats, most likely *Vesperugo pumilus* and *Nictophilus timoriensis*. All the above mammals, with the exception of *Phascologale minima*, *Pseudochirus cooki* and *Perameles obesula* were taken near the Arthur River. Perkins Island yielded the following species: *Dasyurus maculatus*,

Trichosurus vulpecula var. *fuliginosus*, *Perameles obesula*, *Pseudochirus cooki*, *Macropus billardieri*, *Mus fuscipes* and *Phascologale minima*.

The country around the Arthur River, with the exception of a few low ranges of hills, is very flat and swampy and is covered with a very dense forest with such a tangled undergrowth as to make it almost impenetrable. On the hills the undergrowth is less dense and consists, for the most part, of tree-ferns and bracken. Fires have burnt out most of the hills but the low lying country has escaped owing to it being too damp to burn.

Perkins Island is a low lying island consisting of a series of sand dunes running lengthwise of the island which is about three miles long by about one wide, extending east by west. Along the southern edge is a strip of very dense ti-tree swamp. The low sand hills are covered with a thick growth of low scrub with occasional patches of scattered and somewhat stunted eucalyptus and banksia. Between every sand ridge is a narrow strip of grassy swamp. At low tide the island is separated from the mainland by only about one hundred yards of water.

Sarcophilus harrisi, although not plentiful, is not as scarce as is generally believed and I was able to secure six adults and four young from the pouch. They appear to wander about a lot and to have no fixed place of abode, four of the specimens being trapped on an old bridge across the river. *Dasyurus maculatus* is plentiful and eleven specimens were taken, most of them from along the river. *Pseudochirus cooki* seems to be rather plentiful but was taken only from along the edge of the dense ti-tree swamp. The *Trichosurus* was found to be rather scarce and the three specimens secured were taken from the more open parts of the forest.

Potorous tridactylus is scarce and only one specimen (a half grown one) was obtained. It was trapped on a runway through the dense undergrowth. Only four specimens of *Macropus billardieri* were obtained. They are not scarce but are very hard to get owing to their great cunning and their habit of sticking to the very dense undergrowth. Three specimens of *Phascologale swainsoni* were taken from the densest parts of the forest. Two specimens only of *P. minima* were trapped in runways through the grass on the edge of a dense ti-tree swamp. Two specimens of *Perameles obesula* were obtained. One was shot in a ti-tree swamp and one was shot on the beach close to the surf.

Of the bats the two specimens of *Vesperugo*

pumilus were shot while flying through the forest at dusk and one of *Nictophilus timoriensis* was taken from a hut where it had been attracted by the light. *Pseudomys higginsii* and *Mus fuscipes* were so common as to be a pest and were found in all classes of country, with the exception that *P. higginsii* was not taken on Perkins Island."

**Letter to Dr Miller from Ravenshoe,
Atherton Tablelands, Queensland
September 15th 1921**

"Have been able to get some pretty good work in, up here. Have worked both scrub and open forest and have already secured 25 species of mammals, many of which I have not previously secured. The species are as follows:

1. *Dendrolagus lumholtzi*, 2. *Epimys* ?, 3. *Hypsiprymnodon moschatus*, 4. *Dasyurus gracilis* (?), 5. *Trichosurus vulpecula*, 6. *Pseudochirus peregrinus*, 7. *P. herbertensis*, 8. *P. lemuroides*, 9. *Phascologale flavipes* (?), 10. *Phascologale* ?, 11. *Uromys cervinipes*, 12. *U. macropus*, 13. *Macropus parryi*, 14. *M. stigmaticus*, 15. *Macropus* ? 16. *Hydromys fuliginosus*, 17. *Ornithorhynchus anatinus*, 18. *Perameles nasuta*, 19. *P. macrura*, 20. *Canis dingo*, 21. *Dasyurus hallucatus*, 22. A rat kangaroo, I can't identify, 23. *Petauroides volans*, 24. *Pteropus conspicillatus*, and 25. a bat I can't identify." "The dingo, a female, is luckily about as pure a one as I think can be secured. Strange to say it is only the fourth dingo I have seen and the first I had a shot at."

**Letter to Dr Miller from Ravenshoe,
Atherton Tablelands, Queensland
January 16th 1922**

"Have secured thirty-five mammals in this immediate vicinity and two species of bats at Chillagoe, a town about sixty miles west of here The bats were secured in the limestone caves." "I may possibly be able to add several more species to my collection as I have heard of several mammals that are supposed to be around here, which I have not secured ..."

**Letter to Dr Miller from Sydney,
New South Wales
March 12th 1922**

"While in the north of Queensland I was able to gather together some very good stuff. I secured over two hundred and sixty mammals representing

thirty-seven species. Besides these I got eighty-one birds and a miscellaneous lot of reptiles."

Hoy's typescript from the Smithsonian Museum

In addition to the letters and reports held by the Museum was the following typescript. The name given in Hoy's typescript is given first; the corresponding name in the USMNH register (Appendix 1) is added in brackets if different.

Field notes of Australian Mammals

Mus assimilis (*Rattus fuscipes*)

Secured from Wandandian, Bulliac, and Ebor, Eyres Peninsula, and Kangaroo Island. Found in all classes of country, burrowing in banks of creeks, and in the hill rocks. Stomach contents very diversified, containing both vegetable and animal matter and insects. Very readily caught with both raisins and meat baits.

Mus fuscipes (*Rattus lutreolus*)

Secured at Ebor, Arthur River and Perkins Island. Dig burrows in the banks of creeks, high places, in swamps and under logs. They also form long and intertwined runways through the grass. Vegetable matter only in stomachs, but a few were caught with meat baits. They, however, do not seem partial to any particular bait, most specimens being caught in unbaited traps in the runways.

Mus sp.? (*Rattus tunneyi*)

Secured at Brocks Creek and Douglas River, Northern Territory. Digs burrows, both singly and in colonies, in the banks of dry and running water courses and also on the plains at considerable distances from water. Those found on the plains seem to gather in colonies more than those found along the creek beds. Stomachs examined contained only vegetable matter but they will take both raisins and meat.

Mus sp.? (*Rattus lutreolus*)

Secured at Ebor. Lives under and in logs mostly in the scrub, very few specimens being taken in the forest. Stomachs contained both animal and vegetable matter, and insects. Caught on both raisin and meat baits.

Mus sp? (*Pseudomys sp.*)

Secured at Ravenshoe, North Queensland. Live under logs and in holes left by decaying roots and stumps, but do not seem to dig burrows of their own. They will eat anything from jam and carrot to

rotten meat. Will eat other rats and mammals which have been caught in traps but do not seem to eat their own kind. Can be caught on any kind of bait.

Uromys cervinipes (*Melomys cervinipes*)

Secured at Ebor and Ravenshoe. Live mostly in hollow trees and logs but one pair secured in Ravenshoe, was taken from a nest built in the fork of a sapling, about five feet from the ground. The nest was about ten inches in diameter and was composed of the leaves of various trees. Entrance was at side of top. Stomach examined contained vegetable matter only. Caught only with raisin and native nut baits.

Pseudomys higginsii (*Pseudomys sp.*)

Secured only at Arthur River. Found in the same places and seem to have the same habits as *Mus fuscipes*. Caught with both raisin and meat bait.

Hydromys chrysogaster

Secured in Manilla and Tamworth districts and at Ravenshoe. Frequents the banks of rivers and creeks, both in scrub and forest country. Stomach contents of a very mixed nature, including vegetable matter, meat, young birds, fish, various shell-fish and crustacea. Has even been known to raid fowl houses. Digs long breeding burrows and also short ones which are used as "seats" in the non-breeding season. Caught mostly on meat and fish baits but a few were caught with raisins.

Hydromys fuliginosus (*Hydromys chrysogaster*)

Secured at Perth and Busselton, Western Australia and at Brocks Creek, Northern Territory. Habits the same as *H. chrysogaster*. In the Northern Territory they are found only in the creeks and lagoons where there are no crocodiles.

Hypsiprymnodon moschatus

Secured at Ravenshoe. They are found only in the scrub and mostly in the higher portions. They are diurnal, very shy and exceedingly quick in their movements. Stomach contents were of a very miscellaneous nature, including green vegetable matter (evidently leaves of some sort), fleshy roots, fruits, earthworms, larval grubs, and insects. Although they are omnivorous in their diet, I was not able to trap any, but secured all specimens by shooting. A female, secured on August 19th, had two young in the pouch. She had four teats, two of which were very rudimentary. The "remarkable odour of musk" mentioned in various works was entirely wanting in all specimens that I secured.

Potorous tridactylus

Secured at Ebor and Arthur River. Ebor specimen secured in forest close to scrub. Tasmanian specimen taken in scrub. They live mostly on fleshy roots.

Bettongia penicillata

Secured in Busselton district from forest country. Stomach contents composed of fleshy roots and mushrooms. Several were trapped with the Xamia palm used as bait. They build cleverly concealed nests of grass in hollows scooped out of the center of tussocks. When once disturbed out of their nest, they will never return to it, even in the case of a female that has left her young behind.

Aepyprymnus rufescens

Secured at Ravenshoe. Stomach contents mostly vegetable matter of a fibrous nature. Will come into camp in the night and eat scraps of bread that are lying about but do not seem to touch potato parings, or other vegetables. Said to build grass nests but none were seen although looked for every time a "rat" jumped. Forest country.

Dendrolagus lumholtzi

Contrary to general opinion, it seems to spend most of its time on the ground, only taking to the trees when it finds that it is being overtaken. With only one exception, all those seen on trees were comparatively low down and jumped to the ground immediately they were aware of my presence. The one exception was feeding on a high tree, at mid-day, and apparently did not see or hear me. Walking through the scrub at night, they can be heard jumping off the trees and making off on the ground as one approaches. Secured at Ravenshoe. Mostly nocturnal.

***Onychogale unguifera* (*Onychogalea unguifera*)**

Secured in the Kimberley district, Western Australia. Nocturnal, found in plains country. During the day they sit very still under some low bush until approached to within ten or fifteen feet, when they bound away with a loud snort.

***Petrogale lateralis* (*Petrogale inornata*)**

Secured at Ravenshoe. Live in caves and crevices in the rocks, only leaving the rocks during the night when they will spread over the adjacent country to feed. In the morning and late afternoon they may be seen lying on the rocks sunning themselves, but during the heat of the day they will go deep into the rocks.

***Petrogale* sp? (*Petrogale concinna*)**

Habits the same as *P. lateralis*. Several were caught in raisin baited traps. Secured at Brocks Creek, Northern Territory.

Petrogale penicillata

Habits the same as the other *Petrogales*. Secured at Wandandian and Ebor.

***Macropus brachyurus* (*Setonix brachyurus*)**

Secured in the Busselton district. Frequents the swampy parts of the forest where the undergrowth is the thickest. Makes well defined runways.

***Macropus billardieri* (*Thylogale billardieri*)**

Secured at Arthur River and Perkins Island. Found only in the dense scrub where they make well defined runways.

Macropus thetidis* (*Thylogale thetis*) and *M. parma

Secured at Bulliac. Habits of both similar, being confined to the scrub.

***Macropus stigmaticus* (*Thylogale stigmatica*)**

Found only in the scrub but thickest around the clearings. Secured at Ravenshoe.

Macropus eugenii

Secured at Kangaroo Island. Keeps mostly to the thickest scrub.

Macropus agilis

Secured in the Kimberley district, Western Australia and the Douglas River, Northern Territory. During the day they frequent the scrub that lines the river banks, sleeping or noisily fighting or playing about. At night they spread over the adjoining plains to feed. They keep together in immense mobs, over two hundred being seen together at one time.

***Macropus ualabatus* (*Wallabia bicolor*)**

Secured at Wandandian, Bulliac and Ebor. Found in the scrub and those parts of the forest where the undergrowth is thickest.

***Macropus ruficollis* (*M. rufogriseus*)**

Secured at Wandandian and Ebor from both scrub and open forest.

Macropus parryi

Secured at Ravenshoe. Found in forest country, usually in small bands.

Macropus rufus

Secured at Mt Lyndhurst. Keeps mostly to the open plains country.

Macropus robustus

Secured at Ravenshoe. To be found during the

day in among the rocky hill country but will descend on to the adjacent plains at night to feed. The western form *cervinus* was secured at Brocks Creek, Northern Territory. Its habits are similar to the other.

Macropus antilopinus

Secured at Douglas River and Brocks Creek, Northern Territory. It is to be found both on the plains and in the rocky hill country, where it seems to be as much at home as *M. robustus*.

***Macropus giganteus* (*M. giganteus* and *M. fuliginosus*)**

Secured in the Tamworth district and at Ravenshoe in the more level parts of the forest country. The Tasmanian and Western varieties, *fuliginosus* and *melanops*, differ in habit in that they keep more to scrubby country where the undergrowth is thick.

Trichosurus caninus

Secured at Bulliac and Ebor. Although mostly a scrub animal, several specimens were taken from river oaks in forest country.

Trichosurus vulpecula

Found all over Australia. Specimens secured at Wandandian, Bulliac, Ebor, Tamworth, Kangaroo Island, Arthur River, Perkins Island, Busselton, and Ravenshoe. They are to be found in both scrub and forest country but their habits vary in the different districts. In all parts of East Australia, that I visited, they live in the hollow spouts of the trees, feeding mostly on the leaves but occasionally coming to the ground and eating the young shoots of the different grasses and the fruits of the *Xamia* palm. On Kangaroo Island they do not live in the trees, but dig burrows in the banks of the dry creek beds. Some, however, will be found squatting in seats under the low grass trees. They seem to spend most of their time on the ground, very seldom ascending the trees, even to feed. Contrary to the "possums", in other parts, when pursued by a dog they will make for the nearest hole and will even run past trees in reaching it. In the Busselton district they both live in the hollow spouts of trees and in the many caves that abound in that region.

***Trichosurus* sp? (*T. vulpecula*)**

Secured at Port Darwin. This phalanger is very much like *T. vulpecula* in general appearance but it is only about half the size and has a

comparatively shorter and less bushy tail. It lives in caves and crevices in the rocks and only ascends the trees to feed. It is known locally as the "rock 'possum".

***Pseudochirus archeri* (*Pseudocheirus albertisii archeri*)**

Secured in the scrub at Ravenshoe.

***Pseudochirus cooki* (*Pseudocheirus peregrinus*)**

Secured on Perkins Island. Found only in dense ti-tree scrub where it builds nests of bracken in the forks of trees.

***Pseudochirus occidentalis* (*Pseudocheirus occidentalis*)**

Secured in the Busselton district. Formerly this phalanger was very plentiful in that district and used to build a nest in the forks of the ti-trees. Through persecution its numbers have been greatly thinned and those remaining have altered their habits. They no longer build the conspicuous nests in the low ti-trees and have taken to living in the hollow spouts of the larger forest trees.

***Pseudochirus peregrinus* (*Pseudocheirus peregrinus*)**

Secured at Wandandian, Bulliac, Ebor and at Ravenshoe. In New South Wales they are found in both the scrub and the forest country but in the Ravenshoe district they are found in the open forest. Their habits vary, in some localities they build a nest in the forks of the trees and in some they live in the hollow spouts, while in still others they do both.

***Pseudochirus herbertensis* (*Pseudocheirus herbertensis*)**

Secured in the scrub at Ravenshoe. Solitary.

***Pseudochirus lemuroides* (*Pseudocheirus lemuroides*)**

Secured in the scrub at Ravenshoe. Keeps in pairs.

***Petauroides volans* (*Schoinobates volans*)**

Secured at Wandandian, Bulliac, Ebor and Ravenshoe. They live in the spouts of the trees and were taken in both scrub and forest country. Comes out at dusk and plays about on the trees, gliding from tree to tree and running up the trunks with peculiar leaps. It is a very noisy animal and gives a harsh, rasping cry. The variety secured at Ravenshoe is smaller and very quiet.

Petaurus australis

One specimen, only, secured from the top of a high gum tree in forest country at Wandandian.

***Petaurus sciureus* (*P. breviceps*)**

Secured at Wandandian. Found in both scrub and forest, it seems to keep to the trees that are adjacent to the water-courses. It has a peculiar cry, like the yelping of a young pup, which it keeps up continuously for hours at a time.

Petaurus breviceps

Secured at Ebor from open forest country. It gives a cry very much like that of *P. sciureus* but does not keep it up for so long a time.

***Phascolomys mitchelli* (*Vombatus ursinus*)**

Secured at Wandandian where it digs great burrows under the rocks.

Myrmecobius fasciatus

One specimen, only, secured through purchase, from Cranbrook, West Australia, where I am told they are plentiful during the dry season. Stomach contained insects only.

***Phascologale minutissima* (*Antechinus stuartii*)**

Secured at Ebor. They were found in both scrub and forest country, living in and under logs and stumps. The stomachs examined contained nothing but insects but they are very partial to both meat and raisin baits and will not hesitate to chew up another mammal or bird that has been caught in a trap.

***Phascologale flavipes* (*Antechinus stuartii* and *Antechinus sp.*)**

Secured at Wandandian, Bulliac and the Tamworth district. Taken from both scrub and forest country and from caves and crevices in the rocks. Stomachs examined contained insects only but they will take both meat and raisin baits. Very prolific, the females carrying from eight to ten young at a time.

***Phascologale flavipes?* (*Antechinus stuartii*)**

Secured from the scrub at Ravenshoe. In appearance, much the same as *P. flavipes* secured elsewhere, but more rufous. The habits, however, are totally different. They are diurnal and arboreal, climbing about on trees and vines and leaping from limb to limb with great agility. Insects only in stomach but can be caught with meat baits.

***Phascologale sp?* (*Antechinus godmani*)**

Secured at Ravenshoe in scrub. Insects only in stomach but will take meat baits. Very quiet, several being caught by merely walking up to them and picking them up. Will sometimes climb trees when pursued but spend most of their time on the ground.

***Phascologale minima* (*Antechinus minimus*)**

Secured on Perkins Island. Caught in unbaited traps set in the runways of *Mus fuscipes*. Insects only in stomachs.

***Phascologale swainsoni* (*Antechinus swainsonii*)**

Secured at Ebor and Perkins Island from both scrub and forest country. They are found only in swampy parts. Most of the specimens secured were caught in unbaited traps set in the runways of *Mus fuscipes*, but a few were caught with raisin and meat baits. Stomachs examined contained insects only.

Dasyurus hallucatus

Secured at Brocks Creek and Douglas River and at Ravenshoe. They are the most numerous in the rocky parts along the rivers and creeks. Stomachs contained insects, fish, birds and small mammals. Trapped, most successfully with raisin baits. They nest in hollow trees.

***Dasyurus geoffroyi* (*D. geoffroyi*)**

One specimen, only secured in the Busselton district. Its stomach contained insects and a few feathers.

Dasyurus viverrinus

Secured from rocks on sea-shore, at Coogee, a suburb of Sydney. The immediate vicinity of Sydney is practically the only place where this dasyure is now plentiful, it having died off through the ravages of disease in all other parts.

***Dasyurus gracilis* (*D. maculatus*)**

Secured in the scrub at Ravenshoe. Stomachs examined contained insects and the remains of birds and small mammals. One female secured had five young in her pouch (six teats).

Dasyurus maculatus

Secured from scrub country at Arthur River and Perkins Island and at Ravenshoe. Stomachs contained small mammals and birds. They are

very savage animals and great scavengers, the more rotten and maggoty the bait is the more likely you are to catch them.

Sarcophilus ursinus (S. harrisii)

Secured at Arthur River from scrub country. Contrary to their reputation they are not savage animals, although they will never turn tail. When trapped they will always keep their face towards you but they can be approached and picked up by the tail without the least danger of a bite. Stomachs contained parrot and small mammals. Like *Dasyurus maculatus*, they are great scavengers.

Perameles nasuta

Secured at Bulliac and Ravenshoe. Taken from both scrub and forest in New South Wales but from scrub country, only, in North Queensland. Stomachs examined contained insects, earthworms, and larval grubs. Lives mostly in hollow logs, and sometimes in rabbit burrows.

Perameles macrura (Isoodon macrourus)

Secured at Douglas River and Brocks Creek and Ravenshoe from forest country. Stomachs examined contained insects, only, but they will come into camp and eat scraps of cooked meat and dried fruit. Lives mostly in hollow logs but are sometimes found in burrows. The natives say that they dig these burrows themselves, but I was never able to verify this statement.

Perameles obesula (Isoodon obesulus)

Secured in the Busselton district, Perkins Island and Sydney from country of a more or less swampy and scrubby nature. Stomachs contained insects and a few were caught on meat baits.

Ornithorhynchus anatinus

Secured in the Tamworth district and at Bulliac and also at Ravenshoe from streams both in scrub and forest country. They dig long winding breeding burrows, from ten to fifty feet in length, and also short burrows used as "seats" by the males. As far as I know, from personal experience and what I have heard from others, the male has never been taken in a breeding burrow. All the burrows dug out were found to be securely plugged in two or three places (mostly three) whether the female was found in the nest or not. At the far end of the burrow is a rounded, nesting cavity, containing the nest which is composed of leaves, roots, reeds, or willow branches. No two nests found were composed of the same material.

They have from one to three young at a time. The entrance to the burrow is not always at water level, in some cases it will be as high as ten feet above normal water level and from fifteen to twenty feet back from the water's edge, its position depending a great deal on the condition of the bank and as to how high the flood waters reach.

Platypus are rarely seen in the daytime except in the case of a female with more than one young in the nest, when she will have to feed day and night to supply the milk needed for the nourishment of the young. As a general rule they appear about sunset and feed until about an hour after sunrise. In feeding the platypus dives to the bottom and fills its cheek pouches with a mixture of mud, aquatic insects, etc. It then comes to the top and quietly floats about until it has the mud washed out and the food swallowed, whereupon it repeats the performance. If disturbed they will dive and not reappear for an hour or two. In walking on land, the long webbing and claws, on the front feet, are folded under and the animal walks on its knuckles. An adult platypus can remain under water for a period of six minutes but will invariably drown between the sixth and seventh minute. While feeding, it is rarely that they remain under for more than three minutes at a time.

During the breeding season, the poison glands, situated between the muscles of the thigh of the male, are greatly enlarged and each gland will yield about a quarter of a teaspoonful of opaque fluid. Whether the spurs are for defensive purposes, or not, I was never able to ascertain, but in all the live males handled, none, of them, ever made any attempt to use the spurs as a means of defence. On the heel of the female, in a position corresponding to that in which the spur is found on the male, is a socket into which the male's spur easily fits, so it may be that the spur is used in copulation. At Ravenshoe I witnessed a pair copulating. The pair were in an eddy of a swift current and the male slid over the female, from the rear, and assumed a position in which he could very easily stick his spurs into the sockets of the female. I was standing on the bank, only about five feet from them, but owing to the swirling of the water and the way in which they bobbed about, I was unable to see whether he actually used his spurs or not. I subsequently shot the female and while I was getting her out of the river, the male came to the surface and swam up to within three feet of me. Swelling out his body and floating high, until he was almost walking on the water, he threw his head from side to side,

hissing and vigorously splashing the water with his feet and tail. This seemed unusual behaviour for they are generally extremely shy. The cheek pouches examined contained aquatic insects, worms, prawns, and small shell-fish. Although they have a bad reputation, among fisherman, as fish eaters, I never found the slightest sign of fish or fish spawn in their cheek pouches.

Tachyglossus aculeata (*T. aculeatus*)

Secured at Bulliac and in the Tamworth district, Kangaroo Island and Ravenshoe from both scrub and forest country. They spend the day in hollow logs, crevices in rocks and disused rabbit burrows, and, at dusk, come out to feed. When surprised, in country where the soil is loose, they at once commence to dig themselves in and are able to completely bury themselves in a surprisingly short time. At times, they are to be found, buried in the ground, with only the quills on the back showing above the surface. When surprised in rocky country, they generally make for the nearest rock and if they succeed in reaching it before they are overtaken, they wedge themselves very firmly under it. The young are carried, in the pouch, until the quills begin to develop and obtain their nourishment by extending their long tongue and lapping up the milk much the same way as the adult ones do in securing ants. After the quills develop the young are left in a hollow log or burrow and the old one returns from time to time to feed it. The eggs are, no doubt, deposited directly into the pouch for if a female is turned on her back, as soon as she is caught, she will invariably deposit dung in the pouch. The stomachs examined contained the remains of ants, various insects and larval grubs. When kept in captivity they will readily drink milk and show a great liking for chopped meat and eggs.

Discussion

Charles Hoy collected over 1000 specimens of 100 species of mammals from 14 locations around Australia over a three-year period. He provides a valuable snapshot of the mammal fauna of the time. The value of his collections and correspondence derive from his continental overview of the mammal fauna and his reports on its changing status in the years immediately prior to his trip.

A limitation with any collection such as this is that absence from the collection in a particular area does not necessarily mean the species was absent from the area. There are at least three possible reasons for this. Methods of collection may be

wanting. The collector may not have sampled all possible habitats within the local area. And, less effort may be invested at new locations in collecting species already collected elsewhere.

To some degree, Hoy's collection suffered from all these limitations. Hoy collected relatively few species of bat. This is likely to be because he was largely dependent on shooting specimens at dusk. Hoy's collections appear to have been made within a relatively small area around each base camp. Hence his collections at any particular site appear to have sampled a relatively small area. He failed to collect *Rattus fuscipes* or *Antechinus flavipes* at Margaret River and thought that *Isoodon obesulus* was rare. This seems surprising given current abundance. He may have chosen not to collect further specimens as he had many specimens already in his collection from previous work in New South Wales and South Australia. Alternatively, he may have caught few or none due to his reliance on shooting, snares and leg-hold traps rather than on cage traps. This explanation seems unlikely as he caught these species at a range of other sites. He did find *Mus musculus* to be "everywhere through the bush, but nothing was seen of any of the smaller native mammals", indicating that he had searched unsuccessfully.

Threatening processes

Lucas and Le Souef (1909) provided a comprehensive account of the then known knowledge of the Australian fauna, including a species by species account. They focused on hunting as the chief threatening process, listing the number of furred skins sold through the Sydney market in 1908 (1.6 million of which 54% were possum). This trade in skins was additional to native animals killed each year for bounty payments as a pest of agriculture (Short and Smith 1994). Relative values for native mammals killed for skins or bounties in 1908 are given in Table 2.

In contrast to Lucas and Le Souef, Hoy identified a range of factors acting in each district that he visited that he believed were threatening the long-term persistence of native species. These perceived threatening processes can be divided according to three broad geographical divisions:

tropical sites (Derby, Port Darwin and Ravenshoe) – no mention is made of threatening processes at Derby and Ravenshoe. Predation by feral cats

Table 2: Native animals killed for skins or bounties in New South Wales in 1908. Data for skins comes from Lucas and Le Souef (1909) and are for skins passing through the Sydney market only; data for bounties are from the New South Wales Government Gazette (1909).

Species	Skins	Bounties
Possums	873,837	-
Koalas	57,933	-
Kangaroos	99,190	-
Wallabies	402,952	163,225
Rock-wallabies	92,590	-
Kangaroo rats	-	57,293
Pademelons	-	34,139
Wombats	-	293
Bandicoots	-	346
Total	1,526,502	255,296

and annual burning were seen as potential problems at Port Darwin. No mention was made of recent declines of any species of mammal at any of the three tropical sites.

temperate mesic (Wandandian, Gloucester, Margaret River) – land clearing for agriculture, foxes, feral cats (particularly on *Dasyurus*), use of poison to control rabbits, bushfires (often deliberately lit to clean out undergrowth or to promote grass growth for livestock), hunting around settlements or out from major transport arteries, disease (particularly for *Phascogale* and *Dasyurus*), and competition from introduced rodents (particularly on *Hydromys*) were seen as threats.

temperate arid or semi-arid (Tamworth, Port Lincoln, Farina, Central Australia) – foxes (particularly on medium-sized mammals such as rat-kangaroos and small wallabies) and cats (particularly on *Dasyurus*, the small marsupials, and birds) were seen as the primary threats.

Many of Hoy's strongest statements about threatening processes derive from his failure to collect particular species that were reported to have been recently abundant in the local area. Much of this information on the change in abundance of species over time came from local hunters, land-owners and "natives".

Significant observations

Hoy makes several mentions of the recent presence of medium-sized mammals at his collection sites and the rapidity of their decline in the years immediately prior to his arrival. In particular, he

mentions the very recent loss of medium-sized mammals at Tamworth (*Onychogalea fraenata*, *Petrogale* spp., *Aepyprymnus rufescens*, *Wallabia bicolor* and *Macropus rufogriseus*) and Port Lincoln (*M. eugenii*, *Macrotis lagotis*, and *Myrmecobius fasciata*). He attributes these losses directly to predation by foxes. Interestingly, both sites, although over 1500 kilometres apart, experienced an approximate synchrony in decline of their medium-sized mammals. Both are approximately 1000 kilometres from Melbourne, Victoria where foxes were first established in the 1870s (Rolls 1969). Hence, it may be that the eruptive wave of foxes spreading outward from this release point may have arrived at each site at approximately the same time. The peak in the eruptive wave of foxes is known to have reached the northern tablelands of New South Wales in 1918-19 (Short 1998). Ern Parker, an early resident of the Eyre Peninsula, reported the arrival of foxes at Butler (75 km north of Port Lincoln) in 1916 (Parker 1982).

The rapidity of the decline of these mammals is reflected similarly in comments by Jones (1923-5), Finlayson (1927), and the data of Short (1998) for Bettongia. Jones made particular reference to the rapid decline of a number of species from relative abundance to regional extinction in the twenty years prior to his writing (e.g. *Bettongia penicillata*, *B. lesueur*, *Macropus eugenii*, *M. rufogriseus*, and *Dasyurus viverrinus*).

Hoy provides a number of observations of medium-sized mammals or of their recent decline which are relevant to the timing of their demise. For example, the most recent records of *Onychogalea fraenata* (bridled nailtail wallaby = Bridled Wallaby) in New South Wales are from Manilla in the period 1920-24 (Marlow 1958, Australian Museum records). It seems, given Hoy's notes, that these animals came from a captive colony established by Charles Baldwin in or before 1917. The most recent records of this species held by the Australian Museum, other than those from Manilla, are from 1896 (southern New South Wales) and 1911 (northern New South Wales). A captive population was established at Taronga Park Zoo in Sydney in the early 1920s (Le Souef 1923) and an attempt was made to establish a colony on a fox-free island in Lake Macquarie in New South Wales in 1924 (Troughton 1941, Short et al. 1992, Australian Museum records). Both are likely to have been sourced from Baldwin's captive

colony. Historical records of bounty payments on this species from the Tamworth district indicate a peak in abundance in 1909, declining rapidly to disappear from the record in 1918 (Jarman and Johnson 1977). Hence, it would appear that the major decline and regional extinction of *O. fraenata* in northern New South Wales was in the period 1911 - 1917, coinciding with the arrival of the fox.

Hoy mentions the recent occurrence of numbats (*Myrmecobius fasciata*) and bilbies (*Macrotis lagotis* = "pinkies": Le Souef and Burrell 1926) on Eyre Peninsula. *M. fasciata* was not listed as part of the original fauna of Eyre Peninsula by Watts and Ling (1985), but were mentioned by Troughton (1941). They were reported by Jones (1923-25) to occur "along the scrub lands of the Murray" until the early 1900s, although gone from the Adelaide district much earlier. Hence, their reported occurrence on the Eyre Peninsula by Hoy immediately prior to 1919 is of significance. They were reported as present at Ooldea (500 km north-west of Eyre Peninsula) by Daisy Bates, resident in the area from 1919 - 1935 (Bates 1972: 227).

Macrotis lagotis was last recorded in South Australia in 1933 from the far north-west. There are no historical records of their presence on Eyre Peninsula; however subfossils and evidence from Aboriginal dialects indicate its former presence (Kemper 1990). They are believed to have disappeared from other southern areas of South Australia (in the vicinity of Adelaide) by the early 1900s. In the late 1890s it was reported that "it was usual for rabbit trappers, even in the immediate neighborhood of Adelaide, to take more bilbies ... than rabbits in their traps." (Jones 1923-25: 157). However, as late as 1921, *M. lagotis* was recorded at densities of 21 per square mile on the Nullarbor Plain in South Australia (Le Souef and Burrell 1926: 299).

Reference to Hoy (1923) reveals that the wallabies that were harvested on Eyre Peninsula in South Australia were tammar wallabies (*Macropus eugenii*). Hoy puts the timing of their regional extinction as the period 1915 - 1918, again coinciding with foxes becoming established and substantially later than the colonisation by rabbits (Rolls 1969). Both the pattern of decline (abundance followed by sudden collapse) and the cause of decline (foxes) given by Hoy differ from that suggested by Saunders and St John (1987) (slow attrition due to combined impact of

competition from rabbits and predation by foxes). Independent corroboration of Hoy's observation is given by other direct observers. Barney Woods, a jackaroo in 1910 on Coffin Bay Peninsula immediately west of Port Lincoln, claimed that wallabies were abundant on Coffin Bay Peninsula around the turn of the century but "died out" soon after World War I (pers. comm. in 1983 to A. Spiers (Saunders and St John 1987)).

Margaret River and Perth were the only temperate mainland sites where Hoy's visits preceded the arrival of the fox. Foxes were first recorded near Perth in 1927 and in the Margaret River area in 1929 (Long 1988). Hoy's collection of large numbers of medium-sized mammals from Margaret River (*B. penicillata*, *Setonix brachyurus*, and the possums *Trichosurus vulpecula* and *Pseudocheirus occidentalis*) are in marked contrast with his experience at other temperate sites such as Port Lincoln and Tamworth.

Hoy obtained a large sample of *B. penicillata* (13 specimens) at Margaret River, as had Shortridge 15 years earlier (31 specimens: Shortridge 1909). Further specimens were taken at Margaret River in 1928 and on the southern coast (between Albany and Denmark) in the mid-1930s (Kitchener and Vicker 1981), but these were the last to be taken from these districts. Their loss at this time corresponds with the colonisation of the area by foxes. The species persisted in parts of the jarrah forest and adjoining woodland areas (e.g. Tuttaning, Dryandra), apparently due to local conditions that tended to limit or exclude foxes (King et al. 1981).

Shortridge (1909) reported that *S. brachyurus* was "very plentiful" in south-western Western Australia, particularly in coastal thickets and swamps. He collected 38 specimens from three locations in the southwest, including Margaret River. Hoy was able to collect nine specimens in 1920 from "swampy parts of the forest". White (1952) reported their persistence at various sites in the southwest until the late 1920s and early 1930s, but this was followed by "their sudden virtual disappearance from the mainland".

Hoy reported *M. lagotis* to the east of Perth, but apparently never obtained a specimen. Their presence in this area is in contrast to their apparent absence on the Eyre Peninsula at this time. Leake (1962) reported that *M. lagotis* had largely disappeared from the wheatbelt east of Perth by 1899 but reappeared in 1918 after three wet years, to decline to local extinction by 1929. At about the time of Hoy's visit, *M. lagotis* were

in scrubby sandhills inland from Geraldton (Le Souef and Burrell 1926). Records for the species held by the Western Australian Museum peak in the 1920s for south-west Western Australia (15 specimens), but tail off rapidly thereafter (Kitchener and Vicker 1981). The last record of the species in the south-west of Western Australia was from Brookton in 1935.

Hoy contrasted the loss of medium-sized mammals in the period 1915 - 1918 at Tamworth and Eyre Peninsula with an earlier loss of smaller mammals such as *Notomys* (= "jerboa rats" and "jumping rats"), and of *Dasyurus* and *Phascolarctos*. He attributed the loss of the smaller mammals to predation by feral cats, the loss of the quolls to a combination of disease and predation by cats, and the loss of koalas to disease. Hoy's emphasis on predation by feral cats as the cause of the decline in *Notomys* is consistent with the views of some modern writers. For example, Dickman et al. (1993) and Smith and Quin (1996) suggest that predation by feral cats may have been responsible for loss of the larger species of *Notomys* (species > 30 g). Other authors (e.g. Morton and Baines 1985) attributed the loss to competition for scarce resources during drought by rabbits and stock. Disease has been invoked as an explanation for the decline of Australian mammals in the past (Shortridge 1909; Richards and Short 1996), but there is little support for it in the modern literature as a cause of widespread loss of species (e.g. Burbidge and McKenzie 1989; Morton 1990; Dickman et al. 1993). However, both *Dasyurus* spp. and *Phascolarctos cinereus* are believed (or known) to be susceptible to disease (Cockram 1978, Caughley 1980). Hoy's comments on disease in *P. cinereus* seems likely to originate from a common source to those of Troughton (1941).

Dasyurus viverrinus was once a common animal in eastern mainland Australia, but is now believed to be extinct there. Rolls (1969) cites an example where 622 native cats were shot on one property near Geelong in Victoria in 1866. Hoy was only able to obtain two specimens of this species, both from suburban Sydney. He claimed that they only survived on mainland Australia at the beach-side suburb of Coogee – protected by suburbia from spread of a disease at the turn of the century. Jones (1923-25) similarly attributes the rapid decline of this species in South Australia in 1900-1902 to disease. The accumulation of museum records of this species in New South Wales (Marlow 1958) appears to

accord with these accounts. There were numerous records prior to 1905, few in the succeeding 40 years, and then a large number of records in the late 1940s and 1950s. However, this was followed by the apparent extinction of the species on mainland Australia. There have been no confirmed records of the species within the last 30 years; its last record being from remnant bushland in suburban Sydney in 1963 (Australian Museum records; Caughley 1980). It has survived only in Tasmania. The persistence of *D. viverrinus* in coastal bushland and about sea cliffs, apparently isolated by suburbia, and the later persistence of the Tasmanian population as the species declined on the mainland provide graphic examples of the conservation value of having populations that are isolated from each other (Simberloff and Cox 1987). Isolation may protect populations against the spread of contagious disease or other catastrophic events such as the spread of introduced predators.

Hoy suggested that predation by domestic and feral cats may have played a major contributing role in the decline of *D. viverrinus*. Recent observation during attempts to re-establish populations of *D. geoffroyi* in Western Australia have confirmed feral cats as predators of this species (K. Morris, pers. comm.). The role of cats in the transmission of the disease toxoplasmosis provides a possible link between these two threatening processes (Caughley 1980; Richards and Short 1996). However, Hoy's description of the abundance of both feral cats and *D. hallucatus* at his collection site south of Port Darwin suggests the relationship between feral cats and *Dasyurus* may not be a simple one.

Hoy collected a number of specimens that were among the first or last records of particular species or of a species in a particular district. Examples of the former include *Bettongia tropica* and *Antechinus godmani* in northern Queensland. Examples of the latter include *B. gaimardi* in southern New South Wales and *Thylacinus cynocephalus* in Tasmania.

Hoy provided the original record of the occurrence of *Bettongia* in north Queensland, a specimen (USNM238650) being collected at Ravenshoe in November 1921. Later specimens were collected by H. C. Raven (also of the US Museum of Natural History) in May 1922 at Ravenshoe and by P.J. Darlington from Mount Spurgeon in July 1932 (Wakefield 1967). These populations are now regarded as *B. tropica* (Wakefield 1967). The species still persists in a

narrow zone of sclerophyll forest along the western edge of wet tropical rainforest at three locations in north-eastern Queensland, but apparently not at Ravenshoe (Winter and Johnson 1995, Johnson and McIlwee 1997).

Hoy appears to have collected the first specimens of *Antechinus godmani* at Ravenshoe in 1921. Details of this species are provided by Van Dyck (1982, 1995).

Hoy obtained an eastern bettong (*Bettongia gaimardi*) at Wandandian in 1919. This is a significant record as the previous last record of this species in New South Wales was from Balmoral (34° 17' S, 150° 33' E) in 1906 (Marlow 1958). *B. gaimardi* is presumed extinct on mainland Australia (Short 1998).

Hoy did not obtain a Thylacine *Thylacinus cynocephalus* on his visit to north-east Tasmania in 1921, but obtained a skin and skull of this species in 1922. No location data or source is given in the Museum register. Thylacines were killed in Tasmania under a government bounty scheme (the last taken in June 1909) and under a private bounty scheme (the last animal taken in 1914 in northwestern Tasmania at Woolnorth) (Guiler 1985). However, the snaring of Thylacines for zoos (and presumably for museum collections) was still occurring into the 1930s (Guiler 1985). The last known wild Thylacine was captured in 1933 and died in 1936 in Hobart Zoo (Ride 1970).

Hoy obtained *Potorous tridactylus* at Ebor in the northern tablelands of New South Wales, some 65 kilometres from the coast and at an elevation of > 1000 m. Schlager (1981) reported that this species typically occurs in more coastal districts, with only one locality record in New South Wales from the tablelands proper (Armidale in 1899).

Hoy obtained *Petrogale penicillata* in the hills behind Wandandian, close to what is now identified as the southern limit of surviving populations of rock-wallabies in New South Wales (Short and Milkovits 1990).

Hoy collected the skull of a burrowing bettong *Bettongia lesueur* at Margaret River in Western Australia. It is possible this came from limestone caves as sub-fossils of *B. lesueur* have been recorded from Lake Cave at Margaret River (Lundelius 1957). Shortridge (1909) collected at both Busselton (Yallingup) and Margaret River but obtained only *B. penicillata*. He considered that *B. lesueur* did not occur to the west of the Darling Range, largely occurring at

drier sites. The closest specimens to Margaret River listed in the Western Australia Museum (Kitchener and Vicker 1981) are from Kojunup in 1896, Cranbrook in 1907 and Gracefield in 1913. These sites have an annual average rainfall of less than 600 mm compared with 1160 mm at Margaret River. However, boodies, as *B. lesueur* is known in Western Australia, together with wallabies and tammars, were listed as "declared vermin" under the Western Australian Vermin Act 1918 by the Denmark Vermin Board in 1922 (Western Australian Government Gazette 1922: 1455). *Bettongia lesueur* also occurred on the southern coast at King George Sound in the period 1874-79 (specimens held in the Macleay Museum, Sydney). These sites have annual average rainfalls of 900-1000 mm per annum.

At the end of his travels through Australia, Charles Hoy had an overview of the status of the Australian fauna that no one else of the time possessed. In his words: "according to the Australian Museum authorities, and others who should know, there is no one in all Australia who is an authority on Australian mammals or even the mammals of one state!" He recorded a range of threats to mammals in temperate Australia, identified the desert fauna as being particularly vulnerable, but recorded no losses and few threats in tropical Australia. Introduced foxes and cats, poisoning and trapping techniques to control rabbits, land clearing and hunting in localised areas, and regular burning of the forests were important factors in temperate Australia. His fieldwork indicated an approximate synchrony in decline of medium-sized mammals at two distant locations (Eyre Peninsula in South Australia and Tamworth in New South Wales) in the period 1915-1918, which coincided with the arrival of foxes in each area. His observations suggested a rapid loss of fauna rather than a slow attrition.

He identified two major declines in temperate Australia – the first of native rodents; the second of medium-sized marsupials. In addition, he records the decline of specific species that he attributes to a combination of disease and predation from feral cats (the native cats *Dasyurus* spp.) or predominantly to disease (koala *Phascolarctos cinereus*).

Much of the modern literature on the decline of mammals has drawn heavily on a few key historical references (Krefft 1866; Shortridge 1909). These suggest the loss of many species of mammals in

the period 1860 – 1890. Hoy's observations suggest a much later decline - many species of medium-sized mammals persisted into the first two decades of the twentieth century at sites such as Tamworth, Eyre Peninsula, Ebor and Wandandian. If correct, this suggests that many species had a greater resilience to changes in fire regimes, introduction of grazing stock, and rabbit invasion than previously thought. Alternatively, it may have been that patches of relatively undisturbed habitat persisted up until this time, acting as refuges for mammals until subsequently invaded by foxes.

The geographical pattern of decline identified by Hoy is widely accepted today (e.g. Burbidge and McKenzie 1989; Woinarski and Braithwaite 1990). The temporal pattern of two successive periods of decline is gaining acceptance (e.g. Dickman et al. 1993; Short 1999). However, other workers suggest a continuum of decline based on body weight, with smaller species declining earlier than larger species (Smith and Quin 1996). Land clearance for agriculture and stock grazing is regarded as a major factor in loss of habitat for native mammal species (e.g. Lunney and Leary 1988) that is still occurring today (e.g. Dickman et al. 1993). Similarly, the historical impact on native fauna of management techniques to control rabbits is widely acknowledged (e.g. Lunney and Leary 1988; Short 1999). The occurrence of epidemics in *D. viverrinus* and *P. cinereus* populations at the turn of the century and at later times are widely acknowledged, but the relative importance of such epidemics in subsequent declines of these

species remains the subject of debate (Lunney and Leary 1988; Strahan 1985).

Hoy's overview of the decline of the Australian fauna, communicated to the museum and zoo professionals at the various Australian institutions, appeared to prompt a new era in the conservation of Australian mammals. The primary actions were the attempts to salvage species by establishing populations on fox-free islands. These included attempts to transfer and establish species such as toolache wallabies (*Macropus greyi*), burrowing bettong, southern hairy-nosed wombat (*Lasiorhinus latifrons*) and koalas to Kangaroo Island (Jones 1923-1925, Finlayson 1927, Waite and Jones 1927, Finlayson 1958), and bridled nailtail wallabies to Pulbah Island in Lake Macquarie (Troughton 1941). The subsequent history of these introductions has been documented by Short et al. (1992), Copley (1994) and Short (1999).

Charles Hoy's letters, notes and collections provides us with a window to the past – providing insight on the status of Australia's fauna at the time and the likely factors threatening its continued persistence. The loss of species that he ascribes to the twenty years prior to his visit in many ways dwarfs subsequent changes in the remainder of the twentieth century, indicating a slowing in the rate of loss of species. Perhaps we can be more optimistic for the future of Australia's fauna than was Hoy in 1920 when he wrote: "It is only a matter of time before the Australian fauna is extinct and if nothing is done now it will soon be too late."

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Appendix I: Species names used by Hoy in his letters and reports with their modern synonyms.

APPENDIX I

Strahan (1995)	Common name	USMNH data base	Hoy (this paper)
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	<i>Echidna (Tachyglossus) aculeata</i>
<i>Ornithorhynchus anatinus</i>	Platypus	<i>Ornithorhynchus anatinus</i>	<i>Ornithorhynchus anatinus</i>
<i>Antechinus godmani</i>	Atherton Antechinus	<i>A. godmani</i>	<i>Phascogale</i> sp?
<i>A. flavipes</i>	Yellow-footed Antechinus	<i>A. stuartii</i>	<i>Phascogale flavipes?</i>
<i>A. minimus</i>	Swamp Antechinus	<i>A. minimus</i>	<i>P. minima</i>
<i>A. stuartii</i>	Brown Antechinus	<i>A. stuartii</i>	<i>P. flavipes</i>
<i>A. stuartii</i>	Brown Antechinus	<i>A. stuartii</i>	<i>P. minutissima</i>
<i>A. swainsonii</i>	Dusky Antechinus	<i>A. swainsonii</i>	<i>P. swainsoni</i>
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	-	Brush-tailed <i>Phascogale</i>
<i>Dasyurus geoffroyi</i>	Western Quoll	<i>Dasyurus geoffroyi</i>	<i>Dasyurus geoffroyi</i>
<i>D. hallucatus</i>	Northern Quoll	<i>D. hallucatus</i>	<i>D. hallucatus</i>
<i>D. maculatus</i>	Spotted-tailed Quoll	<i>D. maculatus</i>	<i>D. gracilis</i>
<i>D. maculatus</i>	Spotted-tailed Quoll	<i>D. maculatus</i>	<i>D. maculatus</i>
<i>D. viverrinus</i>	Eastern Quoll	<i>D. viverrinus</i>	<i>D. viverrinus</i>
<i>Sarcophilus harrisii</i>	Tasmanian Devil	<i>Sarcophilus harrisii</i>	<i>Sarcophilus ursinus</i>
<i>Myrmecobius fasciatus</i>	Numbat	<i>Myrmecobius fasciatus</i>	<i>Myrmecobius fasciatus</i>
<i>Thylacinus cynocephalus</i>	Thylacine	<i>Thylacinus cynocephalus</i>	
<i>Isoodon macrourus</i>	Northern Brown bandicoot	<i>Isoodon macrourus</i>	<i>Perameles macrura</i>
<i>I. obesulus</i>	Southern Brown Bandicoot	<i>I. obesulus</i>	<i>Perameles obesula</i>
<i>Perameles nasuta</i>	Long-nosed Bandicoot	<i>Perameles nasuta</i>	<i>Perameles nasuta</i>
<i>Macrotis lagotis</i>	Bilby; Rabbit-eared Bandicoot	"pinkies"	
<i>Trichosurus caninus</i>	Mountain Brushtail Possum	<i>Trichosurus caninus</i>	<i>Trichosurus caninus</i>
<i>T. vulpecula</i>	Common Brushtail Possum	<i>T. vulpecula</i>	<i>T. vulpecula</i>
<i>Acrobates pygmaeus</i>	Feathertail Glider	<i>Acrobates pygmaeus</i>	<i>Acrobates pygmaeus</i>
<i>Petaurus australis</i>	Yellow-bellied Glider	<i>Petaurus australis</i>	<i>Petaurus australis</i>
<i>P. breviceps</i>	Sugar Glider	<i>P. breviceps</i>	<i>P. breviceps</i>
<i>P. norfolcensis</i>	Squirrel Glider		<i>Petaurus sciureus</i>
<i>Cercartetus concinnus</i>	Western Pygmy-possum		<i>Dromicia concinna</i>
<i>Pseudochirops archeri</i>	Green Ringtail Possum	<i>Pseudochirops albertisii</i>	<i>Pseudochirops archeri</i>
<i>Pseudochirulus herbertensis</i>	Herbert River Ringtail Possum	<i>P. herbertensis</i>	<i>P. herbertensis</i>
<i>Hemibelideus lemuroides</i>	Lemuroid Ringtail Possum	<i>P. lemuroides</i>	<i>P. lemuroides</i>
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum	<i>P. occidentalis</i>	<i>P. occidentalis</i>
<i>P. peregrinus</i>	Common Ringtail Possum	<i>P. peregrinus</i>	<i>P. peregrinus</i>
<i>P. peregrinus</i>	Common Ringtail Possum	<i>P. peregrinus</i>	<i>P. cooki</i>
<i>Petauroides volans</i>	Greater Glider	<i>Schoinobates volans</i>	<i>Petauroides volans</i>
<i>Hypsiprymnodon moschatus</i>	Musky Rat-kangaroo	<i>Hypsiprymnodon moschatus</i>	<i>Hypsiprymnodon moschatus</i>
<i>Aepyprymnus rufescens</i>	Rufous Bettong	<i>Aepyprymnus rufescens</i>	<i>Aepyprymnus rufescens</i>
<i>Bettongia gaimardi</i>	Eastern Bettong	<i>Bettongia penicillata</i>	<i>Bettongia penicillata</i>
<i>B. lesueur</i>	Burrowing Bettong		<i>Bettongia lesueuri greyi</i>
<i>B. penicillata</i>	Brush-tailed Bettong	<i>Bettongia penicillata</i>	<i>Bettongia penicillata</i>
<i>B. tropica</i>	Northern Bettong	<i>B. penicillata</i>	<i>Bettongia</i> sp.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	<i>Potorous tridactylus</i>	<i>Potorous tridactylus</i>
<i>Dendrolagus lumholtzi</i>	Lumholt's Tree-kangaroo	<i>Dendrolagus lumholtzi</i>	<i>Dendrolagus lumholtzi</i>
<i>Macropus agilis</i>	Agile Wallaby	<i>Macropus agilis</i>	<i>Macropus agilis</i>
<i>M. antilopinus</i>	Antilopine Wallaroo	<i>M. antilopinus</i>	<i>M. antilopinus</i>
<i>M. eugenii</i>	Tammar Wallaby	<i>M. eugenii</i>	<i>M. eugenii</i>
<i>M. fuliginosus</i>	Western Grey Kangaroo	<i>M. fuliginosus</i>	<i>Macropus giganteus</i>
<i>M. giganteus</i>	Eastern Grey Kangaroo	<i>M. giganteus</i>	<i>M. giganteus</i>
<i>M. greyi</i>	Toolache Wallaby		<i>M. greyi</i>
<i>M. parryi</i>	Whiptail Wallaby	<i>M. parryi</i>	<i>M. parryi</i>
<i>M. parma</i>	Parma Wallaby		<i>M. parma</i>
<i>M. robustus</i>	Common Wallaroo	<i>M. robustus</i>	<i>M. robustus</i>
<i>M. rufogriseus</i>	Red-necked Wallaby	<i>M. rufogriseus</i>	<i>M. ruficollis</i>
<i>M. rufus</i>	Red Kangaroo	<i>M. rufus</i>	<i>M. rufus</i>
<i>Onychogalea fraenata</i>	Bridled Nailtail Wallaby		<i>Onychogalea frenata</i>
<i>O. unguifera</i>	Northern Nailtail Wallaby	<i>Onychogalea unguifera</i>	<i>O. unguifera</i>
<i>Peradorcas concinna</i>	Nabarlek	<i>Petrogale concinna</i>	<i>Petrogale</i> sp?
<i>Petrogale mareeba</i>	Mareeba Rock-wallaby	<i>P. inornata</i>	<i>P. lateralis</i>
<i>P. penicillata</i>	Brush-tailed Rock-wallaby	<i>P. penicillata</i>	<i>P. penicillata</i>
<i>P. xanthopus</i>	Yellow-footed Rock-wallaby	<i>P. penicillata</i>	-

Strahan (1995)	Common name	USMNH data base	Hoy (this paper)
<i>Setonix brachyurus</i>	Quokka	<i>Setonix brachyurus</i>	<i>Macropus brachyurus</i>
<i>Thylogale billardieri</i>	Tasmanian Pademelon	<i>Thylogale billardieri</i>	<i>M. billardieri</i>
<i>T. stigmatica</i>	Red-legged Pademelon	<i>T. stigmatica</i>	<i>M. stigmaticus</i>
<i>T. thetis</i>	Red-necked Pademelon	<i>T. thetis</i>	<i>M. thetidis</i>
<i>Wallabia bicolor</i>	Swamp Wallaby	<i>Wallabia bicolor</i>	<i>M. ualabatus</i>
<i>Phascolarctos cinereus</i>	Koala	<i>Phascolarctos cinereus</i>	<i>Phascolarctos cinereus</i>
<i>Vombatus ursinus</i>	Common Wombat	<i>Vombatus ursinus</i>	<i>Phascolumys mitchelli</i>
<i>Pteropus alecto</i>	Black Flying-fox	<i>Pteropus alecto</i>	<i>Pteropus gouldi</i>
<i>P. conspicillatus</i>	Spectacled Flying-fox	<i>P. conspicillatus</i>	
<i>P. scapulatus</i>	Little Red flying-fox	<i>P. scapulatus</i>	
<i>Taphozous georgianus</i>	Common Sheath-tailed fox	<i>Taphozous georgianus</i>	
<i>Hipposideros ater</i>	Dusky Leaf-nosed Bat	<i>Hipposideros ater</i>	
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	<i>Chalinolobus gouldii</i>
<i>C. morio</i>	Chocolate Wattled Bat	<i>C. morio</i>	<i>C. morio</i>
<i>C. nigrogriseus</i>	Hoary Wattled Bat	<i>C. nigrogriseus</i>	<i>C. nigrogriseus</i>
<i>Miniopterus schreibersii</i>	Common Bentwing Bat	<i>Miniopterus schreibersi</i>	
<i>Nyctophilus amhemensis</i>	Northern Long-eared Bat	<i>Nyctophilus amhemensis</i>	
<i>N. bifax</i>	Eastern Long-eared Bat	<i>N. bifax</i>	
<i>N. geoffroyi</i>	Lesser Long-eared Bat	<i>N. geoffroyi</i>	
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat		<i>Nyctophilus timoriensis</i>
<i>Vespadelus pumilus</i>	Eastern Forest Bat	<i>Pipistrellus pumilus</i>	<i>Vesperigo pumilis</i>
<i>Vespadelus regulus</i>	Southern Forest Bat	<i>P. regulus</i>	
<i>V. darlingtoni</i>	Large Forest Bat	<i>P. sagittula</i>	
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	<i>P. tasmaniensis</i>	<i>Vesperigo kreffii</i>
<i>Vespadelus vulturnus</i>	Little Forest Bat	<i>P. vulturnus</i>	
<i>Scotorepens greyii</i>	Little Broad-nosed Bat	<i>Scotorepens greyii</i>	
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat		<i>Nyctonomus norfolkensis</i>
<i>M. planiceps</i>	Southern Freetail-bat	<i>Mormopterus planiceps</i>	
<i>Hydromys chrysogaster</i>	Water-rat	<i>Hydromys chrysogaster</i>	<i>Hydromys chrysogaster</i>
<i>H. chrysogaster</i>	Water-rat	<i>H. chrysogaster</i>	<i>Hydromys fuliginosus</i>
<i>Melomys cervinipes</i>	Fawn-footed Melomys	<i>Melomys cervinipes</i>	<i>Uromys cervinipes</i>
<i>Uromys caudimaculatus</i>	Giant White-tailed Rat	<i>Uromys macropus</i>	<i>Uromys macropus</i>
<i>Mus musculus</i>	House Mouse	<i>Mus musculus</i>	<i>Mus musculus</i>
<i>Pseudomys higginsii</i>	Long-tailed Mouse	<i>Pseudomys</i> sp.	<i>Pseudomys higginsii</i>
<i>?P. delicatulus/P. gracilicaudatus</i>		<i>Pseudomys</i> sp.	<i>Mus</i> sp?
<i>Rattus fuscipes</i>	Bush Rat	<i>Rattus fuscipes</i>	<i>Mus assimilis</i>
<i>R. lutreolus</i>	Swamp Rat	<i>R. lutreolus</i>	<i>M. fuscipes</i>
<i>R. lutreolus</i>	Swamp Rat	<i>R. lutreolus</i>	<i>Epimys</i> sp. (=E. petterdi)
<i>R. norvegicus</i>	Brown Rat	<i>R. norvegicus</i>	<i>Mus decumanus</i>
<i>Rattus rattus</i>	Black Rat	<i>R. rattus</i>	<i>Mus rattus</i>
<i>R. tunneyi</i>	Pale Field-rat	<i>R. tunneyi</i>	<i>Mus</i> sp.
<i>Oryctolagus cuniculus</i>	Rabbit	<i>Oryctolagus cuniculus</i>	Rabbit
<i>Canis lupus dingo</i>	Dingo	<i>Canis familiaris</i>	<i>Canis dingo</i>
<i>Vulpes vulpes</i>	Fox	<i>Vulpes vulpes</i>	Fox
<i>Felis catus</i>	Cat	<i>Felis catus</i>	Feral cat, tabby cat